Ontario

Ministry of Transportation

TRANSPORTATION FOR DISABLED PERSONS IN ONTARIO: TOWARDS A STRATEGY FOR THE 1990's

VOLUME 4
DETAILED OPTIONS STUDIES
(APPENDIX I)

JAMES F. HICKLING
MANAGEMENT CONSULTANTS
LIMITED

TRANSPORTATION FOR DISABLED PERSONS IN ONTARIO: TOWARDS A STRATEGY FOR THE 1990's

VOLUME 4
DETAILED OPTIONS STUDIES
(APPENDIX I)

James F. Hickling Management Consultants
Division of Economics and Policy

March, 1988

90-04982/

NOTE

This is Volume 4 of a study prepared by James F. Hickling Management Consultants Ltd. on behalf of the Ontario Ministry of Transportation, entitled **Transportation for Disabled Persons in Ontario: Towards a Strategy for the 1990's**. The Study is present in four volumes:

Volume 1:	Summary Report
Volume 2:	Main Report
Volume 3:	Appendices to the Main Report
Volume 4:	Detailed Options (Appendix I)

PREFACE

This study was commissioned by the Ministry of Transportation of Ontario to provide a basis for long term policy development and strategic planning in the provision of transport services for disabled people. Although the study is intended to provide a basis for program planning and budgeting, further analysis will be required in order to implement any of the policy initiatives discussed.

Any study of this scope and nature involves assumptions, forecasts and estimates that are inevitably uncertain. Tests conducted by the study team indicate, however, that the study's fundamental strategic conclusions remain the same under a wide range of variation in the underlying assumptions. To aid in the development of detailed implementation programs, the study provides a framework within which further operational assumptions and forecasts can be tested in order to study the implications of alternative approaches.

This research would not have been possible without the help and participation of a number of individuals and organizations in Ontario, including user groups, service providers and governments. The authors are particularly grateful to the members of the Study Committee which consists of Richard Puccini, Kevin Pask, Rob Barnes, Chris Poon, Bob Boyle, Glenn Johnston, Dave Hanes, Kathy Moore, Joan Cappa, Pentti Suokas, Larry Smith, Dave Winkworth, Nino Campitelli and Hau-Chi Pang for their review and comment on the report.

The report reflects the views and conclusions of the authors and not necessarily those of the government of Ontario or the members of the Study Committee.

David L. Lewis, Ph.D.
Partner-in-Charge

Brian Guthrie, P. Eng.
Project Manager

TRANSPORTATION FOR DISABLED PERSONS IN ONTARIO: TOWARDS A STRATEGY FOR THE 1990's

VOLUME 4
DETAILED OPTIONS STUDIES
(APPENDIX I)

TABLE OF CONTENTS

PAGE

NOTE I-i

PREFACE I-ii

Personal Mobility

Option (1)	Enhanced Training	I-2
Option (2)	Enhanced Design Awareness	I-8
Option (3)	Subsidies for Auto Purchase or Lease	I-14
Option (4)	Subsidies for Auto Adaptive Equipment	I-25
Option (5)	Enforcement of Special Parking Provisions	I-32

Urban Area - Specialized Transit

Option (6)	Expansion of Specialized Transit Eligibility and Audit	I-38
Option (7)	Private Sector Paratransit (Taxis)	I-46
Option (8)	Accesible Taxi Subsidies	I-53
Option (9)	Paratransit Services	I-58
Option (10)	Cross-Boundary Service Enhancement	I-66

Urban Area - Public Transit

Option (11)	Design Improvements for Ambulatory Passengers	I-70
Option (12)	Added Training (Blind & Mentally Disabled Persons)	I-77
Option (13)	Accessible Urban Buses	I-79
Option (14)	Accessible Toronto Subway	I-108

Rural Area

Option (15)	Promotion of Specialized Transit	I-114
Option (16)	Accessible Vehicle Subsidies	I-115
Option (17)	Block Grants	I-117

Intercity Services

Option (18) Accessible Intercity Busing I-125
Option (19) Design Improvements for Ambulatory Passengers I-140

Inter-Regional Services

Option (20) Specialized Inter-Jurisdictional Service I-143
Option (21) Accessible GO Bus Service I-163
Option (22) On-Call Accessible GO Bus Service I-163
Option (23) Partially Accessible GO Rail Service I-187
Option (24) Specialized Fixed Route System I-204
Option (25) Design Improvments for Ambulatory Passengers I-234

PERSONAL MOBILITY OPTIONS

OPTION (1) ENHANCED TRAINING

(1).1 SECTOR:

- Personal Mobility.

(1).1 TARGET GROUP:

- Those wheelchair users who use private vehicles as a driver.

(1).3 DESCRIPTION

(This option should be considered in coordination with Options (3) and (4) which describe subsidy mechanisms for personal vehicle purchases.)

Training of some sort is required by all future drivers, and many of us could benefit from additional/supplemental formal training programs. Disabled persons who wish to drive may have several strikes against them: a need for special training, which may or may not be available, and less disposable income to pay for such services.

Specialized training centres are located in many areas of the province[1], serving one half of Ontario's population. However, some of these centres, (especially in Toronto), are overloaded. The other half of the potential disabled drivers in the province, largely located in remote regions, have nothing; yet those in rural are most in need of personal vehicles.

This option has two parts: (i) the funding of existing and new specialized driver training schools, and (ii) the deployment of a mobile training facility to provide service in remote regions of the province.

(i) With additional dollars, centres such as the Hugh MacMillan Centre in Toronto may be able to provide training for more people. Such funds could be used to upgrade equipment at existing centres, or to stimulate the creation of a new services in some areas. A subsidy of $600 per eligible trainee is assumed. (Note that some of these centres get some subsidies via the Ministry of Health.)

(ii) The remote facility conceived here would be operated by two trainers. They would travel in, and use, a fully accessible van carrying a choice of adaptive equipment, and a specially equipped car. The two would tour the province, making appointments in advance of their travel (similar to the touring car diagnostic van operated by the Canadian Automobile Association). They would assess an individuals needs, set up the appropriate equipment in the van or car, and proceed with several hours of on-road training, if feasible.

---

[1] See Appendix E.4.1 for a list.

Initially, these two initiatives would be targeted at wheelchair users only. As demonstrated in Chapter 4, wheelchair users are most in need of transportation assistance. Furthermore, the costs of such training schemes could skyrocket if they were available to all disabled persons. If the initial uptake of the services is low, expanded eligibility could be considered.

The mobile diagnostic van would follow an agreed upon schedule, to cities and towns throughout Ontario. It would be announced months ahead of time when the vans would be visiting particular areas. The van's schedule could be advertised to the public through the publication mentioned above, by various organizations (like the Canadian Paraplegic Association, Multiple Sclerosis Association, etc.) by private service clubs (Rotary, Kinsmen, Lion's club). Interested consumers could then call the organization, using a toll-free number, to set-up a reservation. This appointment would provide a complete assessment of an individual's driving needs and would result in a recommendation of particular vehicles and/or adaptive aids to facilitate driving. Driver training would also be provided; therefore it would be necessary for a car to accompany the van as some individuals do not have access to a car. The van would have a selection of adaptive equipment (i.e. hand controls, etc.).

(1).4 RELEVANT CURRENT INITIATIVES

- Tax rebates (Appendix E.1.4, E.2.2).
- Automotive adaptive equipment alternatives (Appendix E.4.2).
- Driver licensing regulations (Appendix E.1.7).
- Current work being done by rehabilitation centres and vehicles adaption centers. (eg Hugh MacMillan Medical Centre in Toronto).
- Publication of: Vehicles and Adaptive Aids for Elderly and Disabled Drivers - A Buyers Guide, completed by JFH and published by Transport Canada.

(1).5 TOTAL MARKET SERVED

Of the 857,000 disabled persons in Ontario who are not homebound 73% or 620,000 have access to and use a private vehicle as either a Passenger or driver. 60% or 372,000 use the car primarily as a driver and 40% or 251,000 use the car primarily as a passenger.

Preliminary calculations show that the cost of providing training to all disabled drivers in Ontario can be astronomical. In order to constrain the budgetary implications, only those in wheelchairs are considered. There are 12,000 wheelchair users who do, or could, drive (as calculated for Option (3)).

(1).6 MARKET NEED SERVED

50% of the eligible individuals can be served via urban training centres. Thus 6,000 persons will benefit from subsidized training centres.

The other 50% (in remote areas) are served by the mobile facility. It is estimated that the mobile diagnostic team could assess 3 individuals per day (200 per year) which comes to 600 assessments per year. Over a 5 - 6 year period, this means that 3,000 to 3,600 persons will be trained. Thus, two mobile facilities are required to meet the demand of 6,000 persons.

(1).7 TOTAL COST

Table (1).1 shows that the total cost of this option is $808,000 per year, 100% of which is assumed by MTC. (Note that many potential drivers will opt for further training, at their own expense. This is meant to be a starter program.)

Assuming a 10% discount rate, this corresponds to $8M over a 30 year period (in present valued 1986 dollars).

The corresponding value in 1996 would be $1.6M per year, (in 1996 dollars), due to inflation and the growth in the disabled population (as quantified in Appendix B).

TABLE (1).1: TOTAL COSTS FOR ENHANCED TRAINING OPTION

(i) Subsidy of Training Centres		Calculations
Number of eligible trainees		6,000 trainees
/ Number of years in program	/	6 years
* Subsidy, for training one person	*	$600/trainee
TOTAL, Training Centres		**$600K/yr.**

(ii) Mobile Diagnostic Van	Annualized Cost
a) salaries: 2 people full-time @ $30K/yr	$60,000
b) reservation support: toll-free number + office space @ $5/reservation, 1200 annual reservations	$6,000
c) van: $35,000; 6 yr. life	$5,800
d) car: $10,000; 6 yr. life	$1,700
e) demo equipment and set-up: $30,000; 6 yr. life	$5,000
f) training for the trainers	$5,000
g) advertising	$20,000
Subtotal (one mobile unit)	$104,000
Number of units required	* 2
TOTAL, Mobile Vans	**$208K/yr.**
TOTAL (i) + (ii)	**$808K/yr.**

(1).8 UNIT COSTS

The total number of trips attributable to this option is 1.9M per year, as calculated in Option (3). This gives a unit cost of $0.42 per trip.

(1).9 QUALITY OF SERVICE

The automobile or personal van affords drivers and passengers a maximum amount of dignity and physical comfort relative to most modes of travel. Some mental discomfort may arise in everyday operation, but this is a small difficulty, when compared to the independence it provides.

(1).10 LEVEL OF SERVICE

The personal vehicle is superior to all other modes of transit in most LOS criteria. It covers short, medium and long distances, allows for door-to-door destinations, can be utilized spontaneously, and is as fast or faster than most other modes.

(1).11 DEVELOPMENT RISK

This option will only cost $800,000, and as it will receive a high public profile the development risks are minimal.

(1).12 COMPATIBILITY WITH OPERATOR'S MANDATE

It is within the mandate of MTC to provide transportation for the disabled population in Ontario. In so far as MTC is involved in licensing disabled drivers they could provide these individuals help in training and assessment.

(1).13 SYSTEM COMPATIBILITY

In general, there is very little interaction between personal vehicles and other transit modes.

The mobile diagnostic van service would have to work closely with rehabilitation centres and vehicle adaption centres to keep abreast of changing technology.

(1).14 SAFETY CONSIDERATIONS

There is little conclusive evidence with respect to the safety records of disabled drivers.

In 1985 of a provincial total of 331,000 accidents, 566 accidents involved drivers with "physical or medical defects". This number is significantly lower in proportion to the number of disabled drivers within the total population. However, this comparison does not account for the shorter average travelled by disabled drivers.

(1).15 PUBLIC ACCEPTABILITY

The proposed program should be as acceptable to the general public as other initiatives in special needs transportation.

(1).16 HUMAN RIGHTS CONSIDERATIONS

As this is an individual subsidy program, it is not motivated by human rights issues. In fact, the implementation of this program is no guarantee that public transit initiatives could be deferred.

However, the use of personal vehicles is a transportation option which can be considered "integrated" into the main stream.

(1).17 SUMMARY

The advantages of this initiative are summarized below:

- It will help to make more disabled people aware of the possibilities of using personal vehicles, proven to be the preferred mode of travel;
- Disabled drivers will be better, safer drivers with this information, training and assessment program;
- High public profile;
- Very inexpensive (i.e. budget of $800,000).

The disadvantages are listed below:

- It is targeted to only those who can drive, and are wheelchair users.
- It does not actually provide a transportation service, only a training service.

OPTION (2) ENHANCED DESIGN AWARENESS

(2).1 SECTOR:

- Personal Mobility.

(2).1 TARGET GROUP

- Those disabled persons who use private vehicles as either a passenger or a driver.

(2).3 DESCRIPTION

(This option might be considered in coordination with Options (3) and (4) which describe subsidy mechanisms for personal vehicle purchases.)

A properly chosen vehicle can add a whole new dimension to the life of someone whose mobility is restricted by a disability. An improperly chosen vehicle, on the other hand, can cause as many problems as it solves. For example, a car may not provide a wheelchair user with enough space between the front and back seats to load a wheelchair. It is important to provide information to elderly and disabled drivers/passengers to make an informed purchase of a vehicle and adaptive driving aid. This initiative will provide the disabled community with a greater awareness of how a private vehicle can be used to meet their needs. This government-sponsored agency can be thought of as an information centre, dispersing information to the entire disabled community to promote increased use of private automobiles.

As demonstrated by Lewis & Smith [19] almost all disabled drivers could benefit from awareness of vehicle and adaptive equipment designs. Car salesmen and distributors of special equipment frequently receive confused inquiries; basic questions as to whether special features of any sort are available. Automobile designers do not have the disabled users foremost in mind, but such details as sill heights and trunk space can be critical to a disabled driver. Such information is not readily available in brochures. There are all kinds of adaptive aids on the market, accompanied by glossy brochures, but little in the way of a comparative, comprehensive picture.

This option proposes the research, publication and distribution of a comprehensive information booklet which would include:

- Relevant dimensions, design details and costs for the latest automobiles and vans;
- The same as above for adaptive equipment, including lifts, hand controls, etc;
- An evaluation of the above designs and equipment with regard to specific disabilities;

- Contacts and addresses across the province, for those who sell special equipment, and for those who fabricate special adaptations; and

- Contacts and addresses for special training facilities.

Transport Canada, through JFH, produced a slightly less comprehensive booklet in 1984 (excluding the costs and contacts). Such a booklet should obviously be updated annually. The publishing costs would be low, allowing for wide distribution, possibly through user groups, licence bureaus, car dealerships, libraries, training centres, etc.

The publications mentioned above would outline the latest developments in technology and would be sent to all those on a mailing list, which could be updated at any time. A preliminary mailing list could be compiled by MTC, which has a record of licensed drivers in Ontario who require special equipment. A publication like Vehicles and Adaptive Aids for elderly and Disabled Driver - A Buyers Guide could be published on an annual basis. A contract would have to be set-up with a research consulting firm to provide this on-going research.

Equipment Standards

The above option suggests a demand side initiative for adaptive equipment. In conjunction with the supply side, standards for this equipment could be investigated.

There are currently more than 6,000 individuals in Ontario who use special equipment, but there are no standards regarding its design or operation. Retrofit of equipment often occurs **after** individuals pass their licencing examination or the vehicle safety check is performed.

This proposal could also include the study of:

- The mechanical fitness and operational design of equipment on the market;

- The need for re-examination of drivers if new or modified equipment is installed;

- The need for re-qualification of a vehicle which has had new or modified equipment installed;

- Implementable standards or guidelines which are suggested by any of the previous three items.

Standards or guidelines would best focus on the end result, i.e. the **performance** of the driver and vehicle, rather than specific design requirements. Standards would also allow proper insuring of product manufacturers (product liability) which would decrease manufacturer's risk in development, possibly attracting more manufacturers to reducing costs etc.

(2).4 RELEVANT CURRENT INITIATIVES

- Tax rebates (Appendix E.1.4, E.2.2)
- Automotive Adaptive equipment alternatives (Appendix E.4.2)
- Special parking privileges (Appendix E.1.7, E.3.1)
- Driver licensing regulations (Appendix E.1.7)
- Current work being done by rehabilitation centres and vehicles adaption centers. (ie) Hugh MacMillan Medical Centre in Toronto
- Publication of Vehicles and Adaptive Aids for elderly and Disabled drivers - A Buyers Guide, completed by JFH and published by Transport Canada.

(2).5 TOTAL MARKET SERVED

Of the 857,000 disabled persons in Ontario who are not homebound. 73% or 620,000 have access to and use a private vehicle as either a passenger or driver. 60% or 372,000 use the car primarily as a driver and 40% or 251,000 use the car primarily as a passenger. Table below which illustrates the specific market numbers.

TABLE (2).1: NUMBER OF DISABLED PERSONS WHO WOULD BENEFIT FROM ENHANCED DESIGN AWARENESS

SPECIAL FEATURES USED OR REQUIRED	24,000
AWARENESS WOULD ENHANCE USE	399,000
SPECIAL FEATURES OR AWARENESS WOULD ENABLE USE	123,000
TOTAL (1983)	546,000
TOTAL (1986)	591,000

Source: Figure (3).1; Option (3).

(2).6 MARKET NEED SERVED

All 591,000 of these people will not purchase the information book. Based on a 6-year ownership of the vehicle, it is estimated that 100,000 copies of vehicle and adaptive aid booklets will be distributed each year, with new editions published annually.

(2).7 TOTAL COST

It is estimated that this option would cost approximately $380,000 per year as calculated below. This corresponds to $4M (1986) over 30 years, and $800,000/year in 1996, when inflation and population growth is accounted for. (100% of these costs are assumed by the province.)

TABLE (2).2:

Production & Publication Costs		**Annualized Cost**
a)	Annual cost for research and to prepare literature	$ 50,000
b)	Production and mailing cost (100,000 books @ $3/book)	$ 300,000
c)	1 full-time person @ $30,000 (administration)	$ 30,000
TOTAL		**$ 380,000**

(2).8 UNIT COSTS

Disabled drivers take 35 trips/month, and passengers take 15 trips per month. The weighted average (given the proportion of drivers versus passengers) is 27 trips/month. For 100,000 persons served (per year) this gives 32.4 million trips annually. This gives a unit cost of $0.012/trip.

(2).9 QUALITY OF SERVICE

The automobile or personal van affords drivers and passengers a maximum amount of dignity and physical comfort relative to most modes of travel. Some mental discomfort may arise in everyday operation, but this is a small difficulty, when compared to the independence it provides.

(2).10 LEVEL OF SERVICE

The personal vehicle is superior to all other modes of transit in most LOS criteria. It covers short, medium and long distances, allows for door-to-door destinations, can be utilized spontaneously, and is as fast or faster than most other modes.

(2).11 DEVELOPMENT RISK

This option will only cost $400,000, and as it will receive a high public profile the development risks are minimal.

(2).12 COMPATIBILITY WITH OPERATOR'S MANDATE

It is within the mandate of MTC to provide transportation for the disabled population in Ontario. In so far as MTC is involved in licensing disabled drivers they could provide these individuals up-to-date information regarding vehicles and adaptive aids.

(2).13 SYSTEM COMPATIBILITY

In general, there is very little interaction between personal vehicles and other transit modes.

(2).14 SAFETY CONSIDERATIONS

There is little conclusive evidence with respect to the safety records of disabled drivers.

In 1985 of a provincial total of 331,000 accidents, 566 accidents involved drivers with "physical or medical defects". This number is significantly lower in proportion to the number of disabled drivers within the total population. However, this comparison does not account for the shorter average travelled by disabled drivers.

(2).15 PUBLIC ACCEPTABILITY

The proposed program should be as acceptable to the general public as other initiatives in special needs transportation.

(2).16 HUMAN RIGHTS CONSIDERATIONS

This program is not motivated by human rights issues. In fact, the implementation of this program is no guarantee that other transit initiatives could be deferred.

However, the use of personal vehicles is a transportation option which can be considered "integrated" into the main stream.

(2).17 SUMMARY

The advantages of this initiative are summarized below:

- It will help to make more disabled people aware of the possibilities of using personal vehicles, proven to be the preferred mode of travel;

- Disabled drivers will be better, safer drivers with this information, program;
- High public profile;
- Very inexpensive ie. budget of $400,000.

The disadvantages are listed below:

- It does not actually provide a transportation service, only an information service.

OPTION (3) SUBSIDIES FOR AUTO PRUCHASE OR LEASE

(3).1 SECTOR:

- Personal Mobility.

(3).2 TARGET GROUP:

- Those in wheelchairs who can, or might, use personal vehicles as drivers.

(3).3 DESCRIPTION

Personal vehicles can be a major contributor to the mobility of disabled persons in all sectors. Because disabled persons, especially those who are severely disabled, are in income brackets lower than the average person, a major inhibitor of car ownership is cost. The high initial costs of purchasing a vehicle, equipment and insurance are especially onerous.

The objective of this initiative is to stimulate the use of private vehicles via the provision of financial aid to eligible individuals wishing to purchase or lease a vehicle. Wheelchair users would provide proof of their disability (doctor's certificate for example) and proof that they purchased a car for use as a driver (bill of sale); they would then receive a subsidy to cover the purchase price of the car.

The purchase price is a major cost item in owning a vehicle. The subsidy for this cost would be in two parts: 90% of the cost for the first purchase and 50% of the cost for all subsequent purchases. The subsidies would be available over a six year period (the average life of most vehicles). This would inhibit profit from immediate resale.

Several payment schemes could be offered: direct cash payment, loans or leasing arrangements. For instance in a model similar to the British Motability Club, a registered company would act as a liaison between the government, disabled consumers, car agencies and banking institutions. The company would receive an annual grant by MTC to cover administration and overhead. It could then purchase the vehicles, underwrite consumer loans at the bank (if required), and lease or sell the vehicle to eligible consumers.[2] A contract would be set up with eligible consumers and monthly payments arranged. MTC could subsidize a percentage of each monthly payment; however this would lead to substantially higher administration costs than the lump-sum subsidy scheme described above.

The government-sponsored company, acting as a financial liaison between the key players described above, could also advise disabled consumers on appropriate vehicles, equipment and financial alternatives. Therefore this registered company would function in the better interests of the disabled person, and would discuss the pros and cons of leasing versus purchasing, and would also recommend certain makes of vehicles, special equipment, insurance companies, driver training programs, rehabilitation centres/programs, and vehicle adaptation centres. This advice would provide the disabled community with a greater awareness of the options available. This role is discussed further in Option (1) Training.

---

[2] The Purchasing and Supply Office of MTC purchases vehicles for the Ontario government.

This option proposes the subsidy of 90% of the purchase price of a personal vehicle, to a maximum of $8,800[3]. Subsequent purchases (at six year intervals) are subsidized at 50%. Amounts less than 50-90% would be inadequate to cover first costs. The rationale for the reduced subsidy at six years is that the first car purchase, along with other social initiatives, will enable a severely disabled person to obtain employment; i.e. after six years, the individual's financial need should not be so great.

Due to the high subsidy amount, eligibility for this program must be restricted to individuals with the greatest transportation and income needs: wheelchair users who can or do drive. Income should not be a criterion (directly); means tests are a messy and stigmatizing business.

Some adjustment of the eligibility and subsidy percentage is certainly feasible. However, very low subsidies to many people will likely dissipate the effect of reduced capital cost. Also, the risk to the government of the narrow eligibility / high subsidy is lower than that associated with a wide eligibility / low subsidy scenario; it is easier to eliminate dollars than people from the program.

(3).4 RELEVANT CURRENT INITIATIVES

There are several policies which relate to personal vehicle use:

- Vehicle, gasoline and equipment tax rebates; (Appendix E.1.5, E.2.2)
- Special parking privileges; (Appendix E.1.7, E.3.1)
- Driver licencing regulations; (Appendix E.1.6)
- GAINS-D and other COMSOC programs.

Note that these initiatives do little to alleviate the primary obstacle to, or difficulty in, purchasing a car (either as driver or passenger)--the high initial costs.

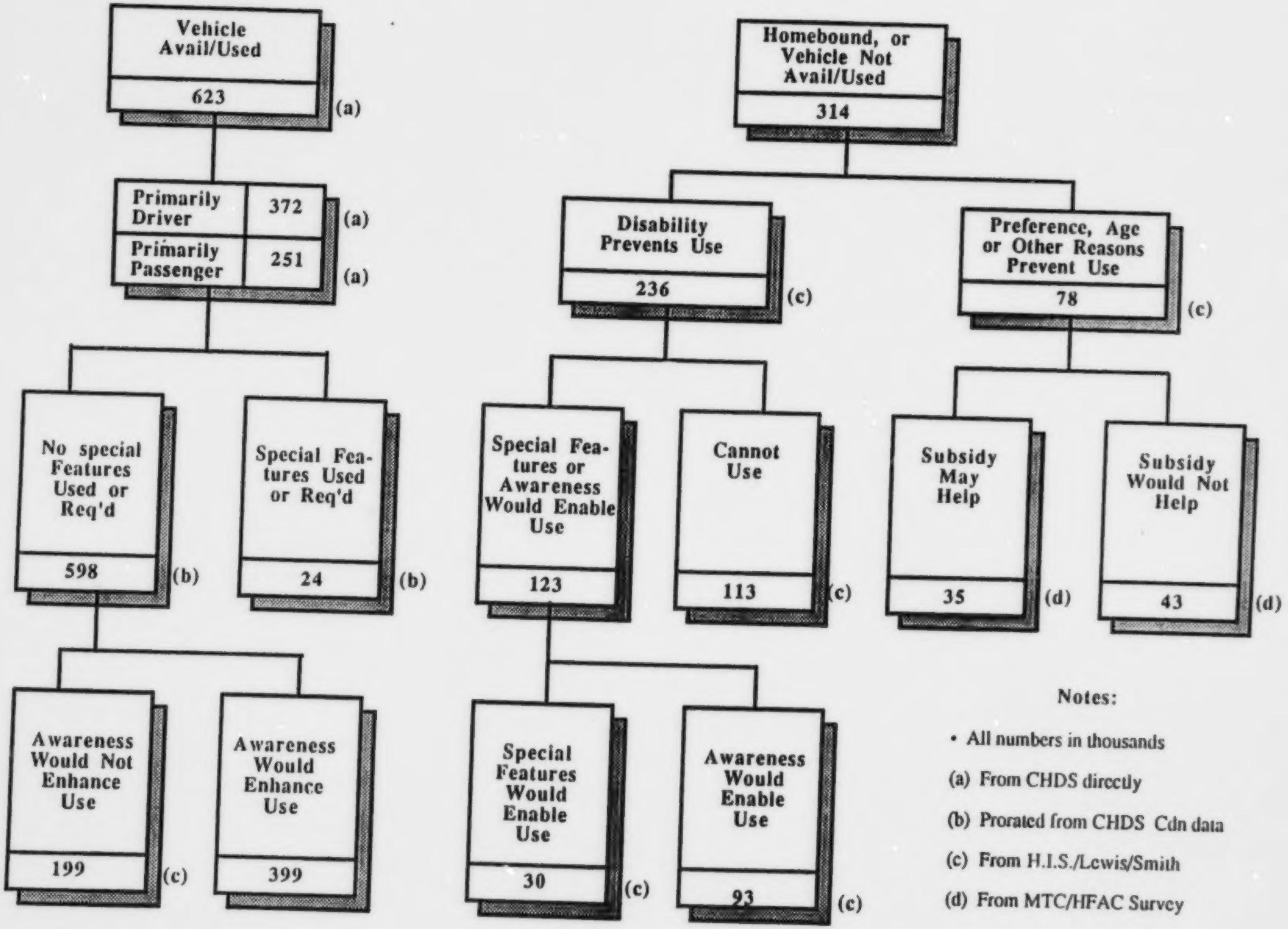
(3).5 TOTAL MARKET SERVED

Figures (3).1 and (3).2 show the disposition of two disabled groups (all disabled and wheelchair users) with regard to sue of personal vehicles. The overall availability and usage statistics are derived from CHDS data directly [2]. the need for special features and design awareness are derived from the U.S. Home Interview Survey [6], as interpreted by the work of Lewis and Smith [19]. Table 3.1 summarizes the values.

---

[3] The maximum amount and the 10% paid by the user serve to dissipate misuse (through resale) and to motivate competitive market forces (through choice).

FIGURE (3).1
PERSONAL VEHICLE USE
(ALL DISABLED)


Vehicle Avail/Used
623
(a)
Homebound, or Vehicle Not Avail/Used
314
Primarily Driver
372
(a)
Primarily Passenger
251
(a)
Disability Prevents Use
236
(c)
Preference, Age or Other Reasons Prevent Use
78
(c)
No special Features Used or Req'd
598
(b)
Special Features Used or Req'd
24
(b)
Special Features or Awareness Would Enable Use
123
Cannot Use
113
(c)
Subsidy May Help
35
(d)
Subsidy Would Not Help
43
(d)
Awareness Would Not Enhance Use
199
(c)
Awareness Would Enhance Use
399
Special Features Would Enable Use
30
(c)
Awareness Would Enable Use
93
(c)

Notes:

- All numbers in thousands

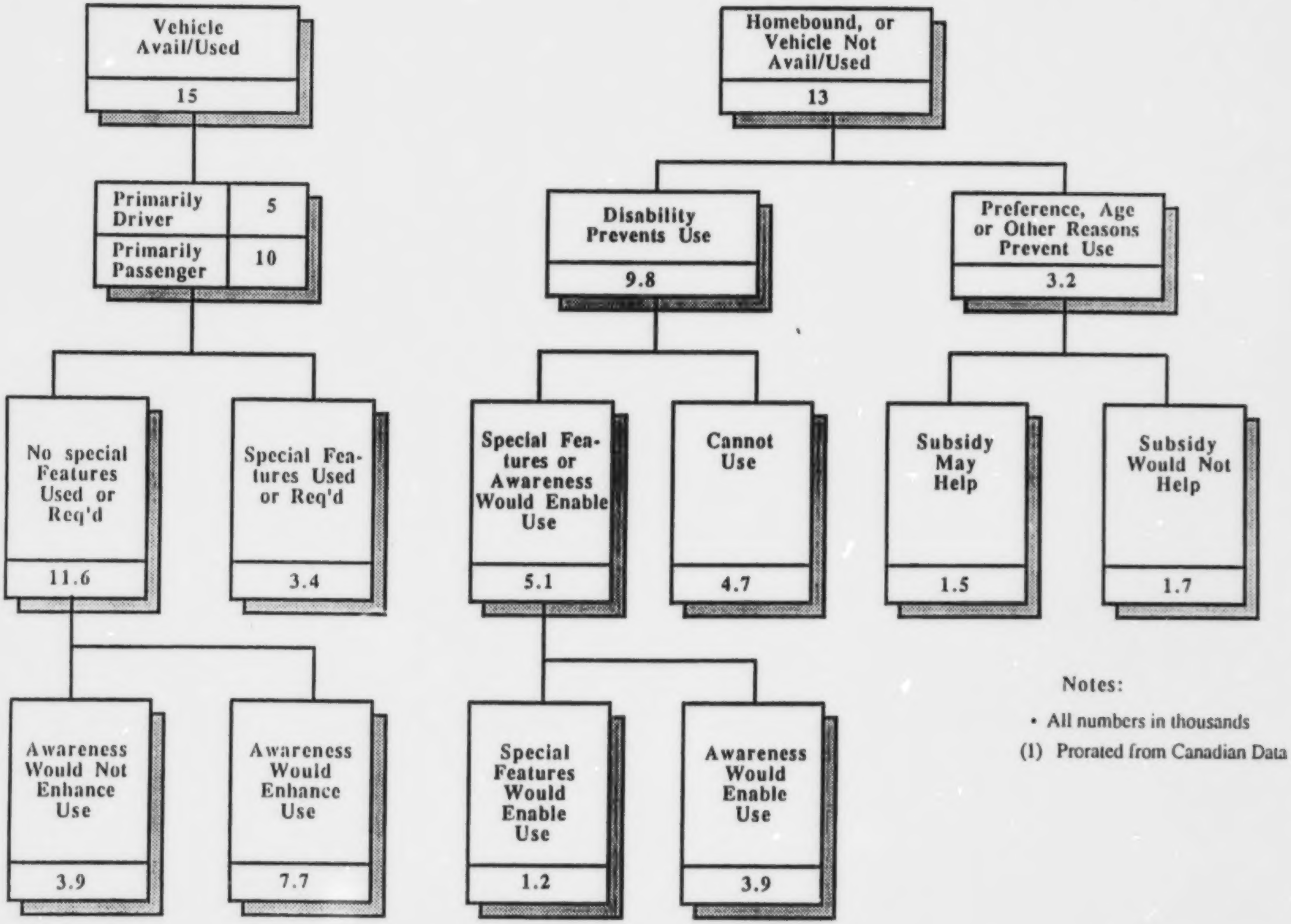
(a) From CHDS directly

(b) Prorated from CHDS Cdn data

(c) From H.I.S./Lewis/Smith

(d) From MTC/HFAC Survey

FIGURE (3).2
PERSONAL VEHICLE USE
(WHEELCHAIR USERS)


Vehicle Avail/Used
15
Primarily Driver
5
Primarily Passenger
10
No special Features Used or Req'd
11.6
Special Features Used or Req'd
3.4
Awareness Would Not Enhance Use
3.9
Awareness Would Enhance Use
7.7
Homebound, or Vehicle Not Avail/Used
13
Disability Prevents Use
9.8
Preference, Age or Other Reasons Prevent Use
3.2
Special Features or Awareness Would Enable Use
5.1
Cannot Use
4.7
Subsidy May Help
1.5
Subsidy Would Not Help
1.7
Special Features Would Enable Use
1.2
Awareness Would Enable Use
3.9

Notes:

- All numbers in thousands

(1) Prorated from Canadian Data

TABLE (3).1: THE NUMBER OF DISABLED PERSONS WHO CURRENTLY OR POTENTIAL COULD BENEFIT BY EQUIPMENT OR SUBSIDIES

	All Disabled (in 000's)	Wheelchair Users (in 000's)
Current Situation		
Primarily Drivers	372	5
Primarily Passengers	251	10
Special Features Used or Required	24	3.4
Potential Improved Situation		
Subsidy may enable use	35	1.5
Special features would enable use	30	1.2
Design Awareness would enable use	93	3.9
Design Awareness would enhance use	399	7.7

Source: Figures (3).1, and (3).2.

(3).6 MARKET NEED SERVED

Preliminary calculations of demands and costs show that costs skyrocket if broad eligibility criteria are used. To be useful, vehicle and equipment subsidy in the order of 50-100% are suggested. (Lower subsidies will not assist disabled persons in overcoming the high initial costs of vehicles and/or equipment). We have thus concluded that high subsidies to a limited group (wheelchair users) is the most effective method of utilizing funds. Variations on the eligibility/subsidy ratio are possible.

Also, means tests are not advised. Subsidies based on income (including sliding scales) are difficult to implement (and perhaps discriminatory).

Table (3).2 show the derivation of the number of wheelchair users who would be eligible for the vehicle subsidy, enumerated at 12,400. (Note that subsidies are provided every 6 years, so the "annual value" is one-sixth of this.)

TABLE (3).2: DERIVATION OF NUMBER OF PERSONS ELIGIBLE FOR VEHICLE SUBSIDIES

All wheelchair users		28,000
- Those who cannot or will not use P.V.'s (from Fig. (3).2)	-	6,400
= Existing or potential P.V. users	=	21,600
* Percentage of users who are drivers[4]	*	48%
= Existing or potential drivers (1983)	=	10,400
* 1983/86 population growth	*	1.083
= Existing or potential drivers (1986)	=	11,200
* New drivers into the system (10%)[5]	*	1.1
= **Total Eligible**	=	**12,400**

---

[4] Estimated by JFH; Currently, 28% of Group A P.V. users are drivers, however, 52% of wheelchair and walker P.V. users are drivers; the "average is 42%, however, there would be an increase in the proportion of drivers if subsidies were offered.

[5] Estimated by JFH. Over a 6-year period, there will be new drivers coming into the system. The number is dependant on the population growth, uptake of the program, medical advances, etc.

(3).7 TOTAL COSTS

The nature of this provision is to subsidize capital cost. Operating costs like insurance, fuel, maintenance, etc. are the responsibility of the user and thus have not been included in the costing of this option. Resale value of the automobile is assumed to be zero.

According to MTC Human Factors Office [10] the average price paid for a vehicle in February, 1986 was $9,785 and the average age of automobiles currently driven in Ontario is 5.8 years. The purchase cost will be partially subsidized by MTC, the remaining cost will be met by the consumer. The percentage of subsidy applied will be 50% per eligible individual every 6 years. For first-time purchases, a 90% subsidy is provided.[6]

Table (3).3 summarizes the calculations, showing that for the first six years, the program will cost $19M per year. For the subsequent years (50% subsidy), the cost is $11M per year. ($21M per year in 1996, if inflation and population growth is considered.) The 30 year total present valued cost is $134M.

TABLE (3).3: TOTAL COST OF VEHICLE SUBSIDY SCHEME

Number eligible		12,400
* Cost/Vehicle	*	9,800
/ Life of Vehicle	/	6 years
* Administration cost (5% of total)	*	1.05
* Subsidized amount	*	90%
= Total cost (first six years)	**=**	**$19.1M/yr.**
For subsequent years:[7] (50% rather than 90% subsidy)		**$10.6M/yr.**

---

[6] A 100% subsidy is not recommended. If users pay some portion of the cost they (i) will exercise more care in selecting a vehicle (and thus maintain some competition in the market place), and (ii) will be less likely to resell the vehicle or equipment for profit.

[7] New drivers into the system are included. See note 5 on Table (3).2.

(3).8 UNIT COSTS

Whether or not this vehicle subsidy program is in place, the average number of private vehicle trips made by the target population will not change. What will change with implementation of this provision is the number of private vehicle users; as the capital costs are reduced by the subsidy. (On the other hand, if the subsidy affected operational costs then the average number of trips per month in all likelihood would increase). However as this option only subsidizes capital costs, the **existing** average number of private vehicle trips/month for the target population is used to arrive at a cost per trip.

According to UMTA surveys, the "transportation handicapped" passengers make 35 private vehicle trips per month as drivers. When taking into account the reduced trip making capability of the target population of (wheelchair users) this study versus the "transportation handicapped", the above trips per month translate to 25 trips respectively.[8] The cost per trip under this option will be the same for all levels of demand, and for all geographic regions, as a linear relationship exists between total costs and total trips (i.e.) trips are dictated by demand which in turn dictate costs.

By the same logic as above, only the trips of the new drivers will (strictly speaking) be attributable to this program. Of the 12,400 wheelchair users who take up the program, 6,000 (in 1986) already drive. Thus there are 6,400 new drivers due to the program.

6,400	users
*25	trips/month
*12	trips/year
1,920,000	trips/year

Corresponding to a total cost of $19.1M, this give a unit cost of $10.00/trip.

(3).9 QUALITY OF SERVICE

The automobile or personal van affords the user a maximum amount of dignity and physical comfort relative to most modes of travel. However it may be somewhat awkward to get in and out of the car and thus vehicle adaptations may be necessary. (See Option (4).) Some mental discomfort may apply, but all drivers assume this "penalty".

---

[8] According to UMTA the transportation handicapped make on average 29.5 trips per month over all modes. Wheelchair users make 21.8 trips per month over all modes. This ratio of 74% is then applied to approximate the monthly private vehicle trips for the target population.

(3).10 LEVEL OF SERVICE

The personal vehicle is superior to all other modes of transit in most LOS criteria. It covers short, medium, and long distances, allows for door-to-door destinations, can be utilized spontaneously (in the case of drivers), and is as fast or faster than all modes, with the exception of airplanes and possibly subways.

(3).11 DEVELOPMENT RISK

The major risk in this initiative is associated with the uptake of this subsidy. The financial risk can be controlled by varying the subsidy, setting maximum subsidy amounts, imposing tighter eligibility definitions, or offering this assistance to only those in lower income brackets.

(3).12 COMPATIBILITY WITH OPERATOR'S MANDATE

It is within the mandate of MTC to provide transportation for the disabled population in Ontario, but not to provide a subsidy mechanism for car leasing and loans. Also, the MTC would be getting involved in a field in which it has no real experience. Some social and government agencies (such as Workman's Compensation) are involved in this type of subsidy.

(3).13 SYSTEM COMPATIBILITY

In general, there is very little interaction between personal vehicles and other transit modes. There would be minimal change in the amount of congestion in the roadways due to the relatively insignificant numbers involved.

The proposed program would overlap, or need to be rationalized with, several existing services:

(i) Those areas currently offering specialized transit;

(ii) A user-side subsidy program, if initiated (see Option (8));

(iii) Those persons who are currently driving specially adapted vehicles;

(iv) Social transportation programs; (eg. COMSOC, Workman's Compensation);

(v) Bank loan programs; car sales and leasing companies.

(3).14 SAFETY CONSIDERATIONS

There is little conclusive evidence with respect to the safety records of disabled drivers.

In 1985, of a provincial total of 331,000 accidents, 566 accidents involved drivers with "physical or medical defects". This number is significantly lower in proportion to the number of disabled drivers within the total population. However, this comparison does not account for the shorter average distance travelled by disabled drivers.

According to the Canada Safety Council, the safety records (based on distance travelled) of elderly drivers are inferior to those of the general public. Seniors are more likely to be involved in accidents, but these generally occur at lower speeds. These trends increase with age. MTC is presently reviewing the licencing criteria for the elderly.

(3).15 PUBLIC ACCEPTABILITY

The proposed program should be as acceptable to the general public as other initiatives in special needs transportation. Disabled persons have been driving for years, with no general outcry.

(3).16 HUMAN RIGHTS IMPLICATIONS

As this is an individual subsidy program, it is not motivated by human rights issues. In fact, the implementation of this program is no guarantee that other transit initiatives could be deferred.

However, the use of personal vehicles is a transportation option which can be considered "integrated" into the main stream.

(3).17 SUMMARY

The pros of this initiative are:

- It will enable more disabled persons to use personal vehicles, proven to be the preferred (and in some cases, only) mode of transportation.
- It will reduce the financial burden of driving (especially initial capital cost), an alternative which is expensive and capital intensive for the individual (but not so expensive to society).
- It will reduce specialized transit usage, freeing it for those who are in the greatest need for that service.
- The subsidy of special equipment would be integrated within this option.
- A government sponsored body could act as a financial liaison, or at the very least could become an information centre recommending certain makes of vehicles, special equipment, driver training programs, rehabilitation centres and vehicle adaptation centres.

The cons are listed below:

- It represents government involvement in a new area, which has traditionally been free market oriented.

OPTION (4) SUBSIDIES FOR AUTO ADAPTIVE EQUIPMENT

(4).1 SECTOR:

- Personal Mobility.

(4).2 TARGET GROUPS:

- Those in wheelchairs who can, or might, use personal vehicles as drivers or passengers.

(4).3 DESCRIPTION

The rationale for this option are similar as for the vehicle subsidy, Option (3). Many severely disabled drivers and passengers require special adaptive equipment in order to use cars and vans. The first cost of such equipment can be prohibitive: some lift adaptations cost $25,000. The average cost of hand controls is $980.

This option offers a 90% subsidy of such equipment, to a maximum depending upon the type of equipment, over a six year design life. Subsequent subsidies are 50%.

The subsidy is offered to wheelchair users who use a vehicle as a passenger or driver. Equipment must be required specifically due to the individual's disability. Wheelchair users would provide proof of their disability (doctor's certificate for example) and proof that they purchased a car for use as a driver or passenger (bill of sale); they would then receive a subsidy to cover any or all of the following capital costs (depending on their needs):

- the retrofit or vehicle adaptation; and
- the purchase of hand controls (for drivers).

Again, eligibility and subsidy level trade-offs can be made in order to suit the policies of decision-makers.

The implementation of the option would (again) be similar to that described in Option (3).

(4).4 RELEVANT CURRENT INITIATIVES

There are several policies which relate to personal vehicle use:

- Vehicle, gasoline and equipment tax rebates; (Appendix E.1.5, E.2.2)
- Special parking privileges; (Appendix E.1.7, E.3.1)
- Driver licencing regulations; (Appendix E.1.6)
- GAINS-D and other COMSOC programs.

However, these initiatives do little to alleviate the primary obstacle to, or difficulty in, purchasing a car (either as driver or passenger)--the high initial costs.

(4).5 TOTAL MARKET SERVED

The number of wheelchair users who would require hand controls or similar adaptive equipment is estimated at 12,400 (i.e. all wheelchair users who would drive, as calculated in Option (3)). The number of drivers and passengers who require structural conversions is based on the number who cannot transfer from their wheelchairs. The calculations are tabulated below (using similar logic to that shown in Table (3).2).

TABLE (4).1: DERIVATION OF NUMBER OF PERSONS ELIGIBLE FOR STRUCTURAL CONVERSION SUBSIDIES

All wheelchair users		28,000
- Those who cannot or will not use P.V.'s (from Fig. (3).2)	-	6,400
= Existing or potential P.V. users	=	21,600
* Percentage of users who are unable to transfer[9]	*	25%
= Existing or potential users (1983)	=	5,400
* 1983/86 population growth	*	1.083
= Existing or potential users (1986)	=	5,850
* New users into the system (10%)[10]	*	1.1
= Total Eligible	=	6,430

---

[9] From the Canadian Paraplegic Association.

[10] Estimated by JFH. Over a 6-year period, there will be new drivers coming into the system. The number is dependant on the population growth, uptake of the program, medical advances, etc.

(4).6 MARKET NEED SERVED

Preliminary calculations of demands and costs show that costs skyrocket if broad eligibility are used. To be useful, vehicle and equipment subsidy in the order of 50-100% are suggested. (Lower subsidies will not assist disabled persons in overcoming the high initial costs of vehicles and/or equipment). We have thus concluded that high subsidies to a limited group (wheelchair users) is the most effective method of utilizing funds. Variations on the eligibility/subsidy ration are possible.

Also, means tests are not advised. Subsidies based on income (including sliding scales) are difficult to implement (and perhaps discriminatory).

The section above shows the derivation of the number of wheelchair users who would be eligible for the adaptive equipment subsidy, enumerated at 12,400. An estimated 6,400 would take advantage of structural conversion subsidies (one half of who are drivers). Note that subsidies are provided every 6 years, so the "annual value" is one sixth of this. As slightly more than one half of the structural conversion beneficiaries are already included in the 12,400, the total number potentially benefitting from this option is approximately 15,000, or 1.5% of the disabled population.

(4).7 TOTAL COSTS

The nature of this provision is to subsidize capital cost. Operating costs like insurance, fuel, maintenance, etc. are the responsibility of the user and thus have not been included in the costing of this option. Resale value of the automobile is assumed to be zero.

Three cost components have been considered in the cost analysis:

- major structural conversions or retrofits (for wheelchair users);
- hand controls and/or other adaptive aids.

A number of assumptions have been made to identify each of these costs. These assumptions are outlined below.

Retrofit Cost: The average price paid to have a vehicle structurally converted is approximately $7,000. It has been assumed that only non-agile wheelchair users (wheelchair users unable to get out of their chair) would need this structural conversion to get in and out of a vehicle. The retrofit cost will be partially subsidized by MTC, the remaining cost will be met by the consumer. The percentage of subsidy applied is identical to the vehicle purchase subsidy.

Hand Controls: The average price paid by drivers for hand controls (i.e. adaptive driving aids) is $985, with reported prices ranging from $5 to $20,000. The largest percentage paid between $251 and $500. Refer to MTC Human Factors Office [10]. For costing this provision the average price of $980 has been assumed, with a life of 6 years (i.e. life of the car). The cost subsidized by MTC, will be 50% to 90% (as above) up to a maximum, with the remaining cost met by the consumer.

TABLE (4).2: COSTS OF EQUIPMENT SUBSIDIES

Item	Structural Conversions	Hand Controls or Equivalent
Number eligible	6,400	12,400
* Cost/conversion	$7,000	$ 980
/ Life of equipment	6 years	6 years
* Subsidized amount	90%	90%
Subtotal	$6.7M/yr.	$1.8M/yr.
Total (for first six years)	**$8.5M/yr.**	
For subsequent years:[11]		
(50% rather than 90% subsidy)	**$4.7M/yr.**	

Note that administrative costs are not included. They are assumed to be covered in the vehicle subsidy program, Option (3).

Thus the 1986 annual outlays for this option is $8.5M. In 1996 it will be approximately $8.7M. The total 30 year cost is $57M.

(4).8 UNIT COSTS

From Option (3) we know that trips made by new drivers will total 1,920,000 per year. 52% of those receiving the structural conversion subsidies (3,300 persons) will be passengers. They travel in vehicles at a rate of 11 trips/month[12], or 436,000 trips/year total. Thus, 2,400,000 trips are made per year. At a total cost of $8M/yr., the unit cost of this program is $3.30/trip.

(4).9 QUALITY OF SERVICE

---

[11] New users into the system are included. See note 10 on Table (4).1.

[12] Wheelchair users travel 36% less than other disabled travellers (who take 15 trips/month.)

The automobile or personal van affords the user a maximum amount of dignity and physical comfort relative to most modes of travel. Some mental discomfort may apply, but all drivers assume this "penalty".

(4).10 LEVEL OF SERVICE

The personal vehicle is superior to all other modes of transit in most LOS criteria. It covers short, medium, and long distances, allows for door-to-door destinations, can be utilized spontaneously (in the case of drivers), and is as fast or faster than all modes, with the exception of airplanes and possibly subways.

(4).11 DEVELOPMENT RISK

The major risk in this initiative is associated with the uptake of this subsidy. The financial risk can be controlled by varying the subsidy, setting maximum subsidy amounts, imposing tighter eligibility definitions, or offering this assistance to only those in lower income brackets.

(4).12 COMPATIBILITY WITH OPERATOR'S MANDATE

It is within the mandate of MTC to provide transportation for the disabled population in Ontario, but not to provide a subsidy mechanism for vehicle equipment. Also, the MTC would be getting involved in a field in which it has no real experience. Some social and government agencies (such as Workman's Compensation) are involved in this type of subsidy.

(4).13 SYSTEM COMPATIBILITY

In general, there is very little interaction between personal vehicles and other transit modes. There would be minimal change in the amount of congestion in the roadways due to the relatively insignificant numbers involved.

The proposed program would overlap, or need to be rationalized with, several existing services:

(i) Those areas currently offering specialized transit;

(ii) A user-side subsidy program, if initiated (see Option (8));

(iii) Those persons who are currently driving specially adapted vehicles;

(iv) Social transportation programs; (eg. COMSOC, Workman's Compensation);

(v) Bank loan programs; car sales and leasing companies.

(4).14 SAFETY CONSIDERATIONS

There is little conclusive evidence with respect to the safety records of disabled drivers.

In 1985, of a provincial total of 331,000 accidents, 566 accidents involved drivers with "physical or medical defects". This number is significantly lower in proportion to the number of disabled drivers within the total population. However, this comparison does not account for the shorter average distance travelled by disabled drivers.

According to the Canada Safety Council, the safety records (based on distance travelled) of elderly drivers are inferior to those of the general public. Seniors are more likely to be involved in accidents, but these generally occur at lower speeds. These trends increase with age. MTC is presently reviewing the licencing criteria for the elderly.

(4).15 PUBLIC ACCEPTABILITY

The proposed program should be as acceptable to the general public as other initiatives in special needs transportation. Disabled persons have been driving for years, with no general outcry.

(4).16 HUMAN RIGHTS IMPLICATIONS

As this is an individual subsidy program, it is not motivated by human rights issues. In fact, the implementation of this program is no guarantee that other transit initiatives could be deferred.

However, the use of personal vehicles is a transportation option which can be considered "integrated" into the main stream.

(4).17 SUMMARY

The pros of this initiative are:

- It will enable more disabled persons to use personal vehicles, proven to be the preferred (and in some cases, only) mode of transportation.
- It will reduce the financial burden of driving (especially initial capital cost), an alternative which is expensive and capital intensive for the individual (but not so expensive to society).
- It will reduce specialized transit usage, freeing it for those who are in the greatest need of that service.

- A government sponsored body could act as a financial liaison, or at the very least could become an information centre recommending certain makes of vehicles, special equipment, driver training programs, rehabilitation centres and vehicle adaptation centres.

The cons are listed below:

- It represents government involvement in a new area, which has traditionally been free market oriented.

OPTION (5) ENFORCEMENT OF SPECIAL PARKING PROVISIONS

(5).1 SECTOR:

- Personal Mobility.

(5).2 TARGET GROUP:

- Non-ambulatory disabled drivers.

(5).3 DESCRIPTION

Many disabled drivers complain about the lack of available parking spaces. In fact. it is one of their foremost difficulties, according to the recent MTC Human and Social Factors Office survey [10]. The problem seems to be threefold: abuse by the general public (parking in designated areas), use by disabled passengers (who could be dropped off), and insufficient spaces.

This option suggests:

- Stricter enforcement of municipal bylaws;
- Information programs to discourage abuse by disabled passengers;
- Enforcement of the standards for number of spaces per person served, in municipally controlled parking lots; and
- Promotion of the designation of special parking in private lots.

An additional complaint of the drivers from the same survey was that special licence plates are stigmatizing. MTC is currently investigating alternatives, including the issuance of a "portable" permit, to be carried on the sun visor.

(5).4 RELEVANT CURRENT INITIATIVES

- Specialized parking plates (Appendix E.1.7)
- Municipal parking and traffic (Appendix E.3.1)

(5).5 TOTAL MARKET SERVED

12,000 disabled drivers will be served, as calculated for Option (3).[13]

---

[13] Passengers are not included. They can be dropped off.

(5).6 MARKET NEED SERVED

Those drivers who are non-ambulatory are served, on trips which involve use of parking lots or publically available spaces. Disabled drivers will park in lots or special spaces for 50% of their trips. Using the total number of trips as calculated in Option (3), this gives a total of 960,000 trips/year served.

(5).7 TOTAL COSTS

Cost calculations for this option are very difficult to make, and must be considered as very rough estimates only. See Table (5).1 below.

The table shows that this option will cost the province $94,000 per year, and the province plus municipalities $494,000 per year. The corresponding 1996 values are $200,000 and $1M per year respectively. The total 30 year (present valued) cost is $5M.

TABLE (5).1: TOTAL COSTS FOR SPECIAL PARKING OPTION

(i) Enforcement (assumed by municipality)	
Wages of Enforcement Officer	$40K/year
* Percent of officer's time spent on parking	* 10%
* Number of municipalities with parking by-laws	* 100
= Subtotal, Enforcement	**= $400K/year**
(ii) Permit Issue (assumed by MTC)	
No. of permits used	12,000
* Cost/permit (incl. admin.)	* $10
/ Life of permit	/ 5 years
= Subtotal, Permits	**= $24K/year**
(iii) Information Program (assumed by MTC)	
Cost per booklet	$ 2
* Number of booklets per year	* 10,000
= Total cost of booklets	= @20K per year
+ Marketing efforts, administration	+ $50K/year
= Subtotal, Information	**= $70K/year**

Adding the three subtotals above gives a total cost of the program in the order of $494,000 per year, with $94,000/year assumed by MTC.

(5).8 UNIT COSTS

At an annual total of $494,000, serving 960,000 trips per year, the unit costs are $0.51/trip.

(5).9 QUALITY OF SERVICE

The automobile or personal van affords the user a maximum amount of dignity and physical comfort relative to most modes of travel. However it may be somewhat awkward to get in and out of the car and thus vehicle adaptations may be necessary. (See Option (4)). Some mental discomfort may apply, but all drivers assume this "penalty".

(5).10 LEVEL OF SERVICE

The personal vehicle is superior to all other modes of transit in most LOS criteria. It covers short, medium, and long distances, allows for door-to-door destinations, can be utilized spontaneously (in the case of drivers), and is as fast or faster than all modes, with the exception of airplanes and possibly subways.

(5).11 DEVELOPMENT RISK

There are no major risks with this option. It is low cost, and will definitely benefit many travellers.

(5).12 COMPATIBILITY WITH OPERATOR'S MANDATE

It is within the mandate of MTC to provide transportation for the disabled population in Ontario, to oversee parking regulations and to issue special licenses.

(5).13 SYSTEM COMPATIBILITY

In general, there is very little interaction between personal vehicles and other transit modes. There would be minimal change in the amount of congestion in the roadways due to the relatively insignificant numbers involved.

(5).14 SAFETY CONSIDERATIONS

Allowing more disabled drivers to park closer to their destinations may enhance their safety

(5).15 PUBLIC ACCEPTABILITY

The proposed program should be as acceptable to the general public as other initiatives in special needs transportation.

(5).16 HUMAN RIGHTS IMPLICATIONS

This program is not motivated by human rights issues. In fact, the implementation of this program is no guarantee that other transit initiatives could be deferred.

However, the use of personal vehicles is a transportation option which can be considered "integrated" into the main stream.

(5).17 SUMMARY

The pros of this initiative are:

- It will enable more disabled persons to use personal vehicles, proven to be the preferred (and in some cases, only) mode of transportation.
- It will reduce the physical burden of getting to and from cars.
- The cost is relatively low, with many persons benefitting.

The cons are listed below:

- There is no absolute monitor of how successful the program is.

URBAN AREA OPTIONS
SPECIAL TRANSIT

OPTION (6) EXPAND SPECIALIZED TRANSIT ELIGIBILITY AND AUDIT

(6).1 SECTOR:

- Urban.

(6).2 TARGET GROUP

- Those unable to use public transportation.

(6).3 DESCRIPTION

Since 1979, the Ontario Ministry of Transportation and Communication has helped finance municipally operated specialized transportation systems for disabled persons. Municipalities are eligible for assistance in the provision of service to individuals who are **unable to board** regular transit. Eligibility is administered at the municipal level.

However, municipalities interpret the provincial eligibility guidelines in a wide variety of ways and subsidies are some times applied to persons for whom provincial assistance is not intended. Kingston, for example, is a municipality where the "cannot board" definition is strictly enforced. On the other hand, municipalities like Hamilton use a "cannot board with dignity" definition; other municipalities like Brantford use a "cannot use" definition. Refer to Table (6).1 which provides a cross-section of the different eligibility criterions used throughout the 52 Ontario transit properties currently providing specialized transit service.

In fact, at least 21 of the 52 operators in 1985 used relaxed guidelines. The estimated makeup of all 1986 registrants in Ontario is as follows:[14]

---

[14] See Appendix E.1.1 for background.

TABLE (6).1: CURRENT PARATRANSIT ELIGIBILITY CRITERION FOR ONTARIO

Eligibility Criterion	Number of Systems in Ontario using criterion
Unable to board	45
Unable to use/unable to use with dignity	21
Mentally disabled*	14
Legally Blind*	19
Elderly*	9
Epilepsy/Alzheimer/Autistic*	17

Source: 1985 Physically Disabled Transit Statistics.

* These are not strict "eligibility criteria." The specified systems may allow persons with the stated disabilities.

As established in Chapter 4 of the Main Report, those who can board public transit, but cannot get to the stop are not eligible for specialized transit, under the strict interpretation of the eligibility criteria[15]. These individuals are clearly in need of assistance.

This proposal is to extend eligibility to those "unable to use" public transit, i.e. to accommodate those who are presently unable to get to public transit stops. Those "other" disabled persons who are presently registered, but who would still not meet this new criterion would remain registered. However, extending eligibility formally to the elderly, mentally impaired and blind is not suggested. There are two principal reasons for this: (i) the interpretation of these persons' ability to use public transport is very difficult, even for a medical practitioner; and (ii) such an expansion of eligibility may "open the floodgates", swamping the system and severely reducing levels of service.

A special caution with regard to the mentally impaired is appropriate here. The definitions and demographics of mentally impaired people vary tremendously. The size of this group is, in all likelihood, underestimated in the CHDS. The CHDS estimate their numbers to be 25,000; other references quote numbers in the order of 1.8 millon [8].

---

[15] As of the autumn of 1987, the Ontario Government is considering a widening of eligibility.

A second component to this option is the Ontario-wide enforcement of eligibility guidelines. Consistent interpretations of eligibility will allow the Ministry to remove some uncertainty regarding future program resource requirements[16]. Enforcement could be instituted via a regular audit process[17], as proposed in a previous JFH report [15]. (Again, those currently registered, but not strictly eligible, cannot be suddenly rejected. Some exercise of a compassionate "blind eye" can be maintained.)

With the increased number of registrants, new vehicles, and/or improvements efficiency will be required in order to maintain the level of service. These initiatives are contained in some of the other suggested options.

Inconsistent interpretations of eligibility also hinder smooth application of provincially mandated reciprocal eligibility among municipalities and leave the ministry in a position of uncertainty regarding future program resource requirements. Furthermore municipalities with relatively loose eligibility criteria will draw disproportionate levels of subsidy, leading to the inequitable distribution of provincial subsidy dollars. Cost implementations of widening the market size beyond the intended beneficiaries can be severe and may result in diminished service quality for those most in need of specialized transportation.[18]

(6).5 TOTAL MARKET SERVED

If specialized transit eligibility guidelines were to be loosened across all Ontario municipalities to include those who cannot use public transportation, it is estimated an additional 24,000 individuals would register, or 77,000 registrants in total, as calculated below.

---

[16] An enforced, consistent province-wide eligibility definition could also ease cross-boundary problem. See Option (10).

[17] The audit process might involve random checks (by the Ministry) of the registrants of a particular system, via telephone interviews, riding on vehicles, or other such means.

[18] Municipalities can improve their provincial subsidy through improved productivity, usually defined in terms of trips per vehicle-hour. Since trips per vehicle-hour increases most dramatically with increased ridership, the formula may provide municipalities with an unintended incentive to improve their draw on provincial subsidies by expanding eligibility criteria beyond that specified under the provincial program.

TABLE (6).2: CURRENT MAKE-UP OF 1986 SPECIALIZED TRANSIT REGISTRANTS

Eligibility Definition	**Percentage of Registrants**	**Number of Registrants**
Unable to board	50%[19]	26,500
Unable to use (excl. "board")	29%	15,400
Mentally Impaired[20]	13%	6,900
Elderly[20]	7%	3,700
Blind[20]	1%	600
Total 1986 Registrants	100%	53,000[21]

Source: Table E.2, Appendix E.1.1.

---

[19] See Table E.2 for derivation of percentages.

[20] Although the base data infers unduplicated totals, some of the individuals in this group may also be unable to use or board.

[21] Estimate, based on 50,500 registrants in 1985 and 55,000 in 1987.

TABLE (6).3: PROJECTED MAKE-UP OF 1986 SPECIALIZED TRANSIT REGISTRANTS

If Eligibility Expanded (to "Unable to Use") and similar number of operators allow relaxed eligibility.

Total Eligible in Ontario (1986) (i.e. Those Unable to Use P.T.)[22]		90,300
Percentage of Ontario covered	*	75%
Total Eligible in current service area	=	67,700
Minus percentage who do not register[23]	-	10%
Number of eligible who register	=	61,000
Plus 21%[24] "extras" (mentally impaired, blind, elderly)	+	16,200
Total registrants under revised eligibility	=	**77,200**

(6).6 MARKET NEED SERVED

This option expands eligibility to those who cannot get to public transit stops, an estimated 35,000 persons in urban areas. (Note that some of these travellers are already registered under relaxed eligibility guidelines.)

The new guidelines will increase registration to 77,200, including 16,300 who are not strictly "unable to use" P.T. (i.e. the blind, mentally impaired, elderly who are already allowed).

As calculated from 1985 MTC statistics, the average specialized transit registrant takes 31.5 trips/year on this mode. Thus, the total trips served in the option are 2.43 million per year.

---

[22] 1.21% of the total population, as derived in Section 4.1 of the Main Report.

[23] Estimated value; specialized transit operators content that "almost all" who are eligible will register.

[24] From Table (6).2.

(6).7 TOTAL COSTS

The total cost calculations for this option are based on:

(i) the unit costs for specialized transit vans in 1985 ($15.75/trip) for current registrants;

(ii) the unit costs for the equivalent taxi trips ($7.10/trip)[25] for additional registrants.

TABLE (6).4: TOTAL COSTS FOR EXPANDED ELIGIBILITY OPTION

Current trips	1,800,000 trips/yr.
Cost/trip	* $15.75/trip
Subtotal	= $28.4M/yr.
New trips	630,000 trips/yr.
Cost/trip	* $ 7.10/trip
Subtotal	= $ 4.5M/yr.
TOTAL	**$32.8M/yr.***
MTC subsidy (50%)	$16.4M/yr.

Note that this assumes that the taxi initiatives of Option (7) are pursued in conjunction with this option.

The 1996 cost to MTC would be $30M/year, and the total cost over 30 years (excluding fares) would be $310M.

* If fares are excluded, the total cost is approximately $30M/year.

---

[25] See Option (7).

(6).8 UNIT COSTS

The average cost per trip for the new service is a blend of taxi and specialized van unit costs or $13.60/trip.

Note that the user typically pays 8% of the cost (via regular fares), giving a unit cost to provincial and municipal governments of $12.50/trip.

(6).9 QUALITY OF SERVICE

This initiative would have no effect on the quality of service provided.

The quality of service of specialized transit is quite high; however, it is not as high as the taxi and automotive options. The passenger is still able to maintain self respect throughout the trip.

(6).10 LEVEL OF SERVICE

The level of current specialized transit service may deteriorate if eligibility is expanded. For instance, new vans will be bought over time to meet the rising demand. As this increase in the fleet is reactive, lag periods, when the demand cannot be met, may occur. These lag periods may result in high waiting periods and/or poor levels of service.

However, if the taxi initiatives of Options (7) and (8) are pursued in conjunction, levels of service may improve.

(6).11 DEVELOPMENT RISK

The takeup of specialized transit under this broad definition is hard to predict, as those who "cannot board" public transportation are hard to identify. Therefore lower level of service and higher costs may result if more people register for the service than expected.

(6).12 COMPATIBILITY WITH OPERATOR'S MANDATE

Definition of specialized transit eligibility is the prerogative of MTC, however application of the criteria is left up to the municipality. (Note the comments re auditing the operators.)

(6).13 SYSTEM COMPATIBILITY

Specialized transit services generally run door-to-door, so that interface with other modes is not an issue. Cross-boundary problems are an issue and can be attributed, in part, to differing application of eligibility criteria by different municipalities. This problem would be solved by a consistent province-wide eligibility definition. (See Option (10).)

(6).14 SAFETY CONSIDERATIONS

(Not an issue.)

(6).15 PUBLIC ACCEPTABILITY

(Not an issue.)

(6).16 HUMAN RIGHTS CONSIDERATIONS

The longer term question of integration must be addressed. However, it is generally accepted that there will always be a need for some specialized door-to-door transit, even if public transit is made fully accessible.

(6).17 SUMMARY

The advantages of this change in eligibility are:

- Benefits a targeted group: those unable to get to stops;
- Subsidy dollars are put towards helping more users of specialized transit (i.e. ridership will increase by 35%); and
- Higher utilization of vehicles.

The disadvantages of this change in eligibility:

- Will cost MTC $2.0 million in extra subsidies;
- Avoids the longer term question of integration; and
- Could lead to further "loosening" of eligibility, if the operators are not audited.

OPTION (7) PRIVATE SECTOR PARATRANSIT (TAXIS)

(7).1 SECTOR

- Urban.

(7).2 TARGET GROUP

- Those eligible for specialized transit; i.e. those who are unable to use public transit.

(7).3 DESCRIPTION

This initiative suggests that taxis be used in conjunction with existing specialized transit vans. The taxi services could operate under a common either as independent services (as at present) or under the same operating authority as the specialized transit system. The former is preferred, with a subsidy to the user (rather than the taxi operator) in order to preserve a basic advantage of taxi service: the private, free-market orientation.

This initiative is motivated by the desire to improve service and reduce overall costs; it is not fundamental change in policy direction.

Some municipalities in Ontario and Canada have begun to use taxis in conjunction with paratransit services with great success. The per trip costs are lower, the level of service is better, and the risk to the funding agency is reduced.

In terms of the total costs, taxis are cheaper than paratransit; the average taxi trip costs $5-$8, as opposed to $13-$16 for paratransit, as demonstrated by systems in Hamilton, Calgary and Quebec City. The reasons for the lower costs for taxi are twofold: (i) drivers are not unionized, and (ii) the taxi system is very demand responsive. (These are discussed further below.)

Taxi companies provide almost immediate service, due to the number of vehicles and direct dispatch systems. They generally serve one origin/destination pair at a time. For these reasons, taxis provide faster and more responsive service than paratransit vans. Furthermore, taxis can relieve some of the load on over booked paratransit systems, providing passage for ambulatory travellers.

As privately run operations, taxi companies must be demand responsive. If demand is low, vehicles are removed from service, temporarily or otherwise. (Whereas paratransit vans often run empty.) In other words, if total demand estimates are inaccurate, little money is wasted. A high risk associated with this initiative is that costs escalate due to drivers becoming unionized (especially if the taxis are operated under the specialized transit authority and not left to their private orientation).

Eligibility would be identical to the specialized transit system. The taxis would be dispatched for ambulatory travellers, with specialized transit vans serving those requiring a lift.

Existing taxi use by the target group is relatively infrequent, due primarily to the high cost (to the user). A subsidized system would appear to lessen the cost constraint, which may increase the number of users and the frequency of trips.

A subsidized taxi program involves financial support to the above defined target group for taxi service. There are several objectives to initiating such a program, namely:

- increased mobility to the target population unable to use and/or afford existing transportation services (both public and private), or to provide another alternative where few exist (rural);
- maximize the use of existing transportation resources rather than initiating a program utilizing new resources;
- preserve a "free-market" system with its inherent efficiencies and market responsiveness;
- complement, not compete with existing public transport;
- simplify administration, management and operations, and minimize cost; and
- relieve pressure on existing transportation services, namely, specialized transit.

It would seem reasonable that a subsidy program could feasibly satisfy all of the above goals. Generally, subsidies can be beneficial for both the users and the service providers. They reduce the cost of travel to the eligible users, thereby enabling these people to travel more often. These additional trips (trips that otherwise might not have been taken) can increase the revenues of the participating private carriers.

Specialized transit would continue to operate in the current manner, providing a service to those who are eligible under the subsidy program, and who cannot use taxis because they are unable to leave their wheelchair; other eligible users could still use specialized transit, but would likely (depending on user cost) take taxi if the choice were their's. In the long term, accessible taxis (such as those used in Vancouver) could be brought into service possible, eventually replacing paratransit vans.

In a subsidized system, several mechanisms are available to distribute the subsidy to the program, each with its pros and cons. The two basic schemes are provider-side subsidy and user-side subsidy. Provider-side subsidy, as the name would imply, is a subsidy to the service provider to offset the costs of capital and operations, which translates to reduced fares to the users. Typically, subsidies in this case are based on indicators such as vehicle-hours, vehicle-kilometers or number of passengers moved. Several problems can occur under such an arrangement. First, it is difficult to control the amount of subsidy and to guarantee that it is applied correctly, especially if the service is also provided to those other than the targeted population. Second, there is little incentive to be productive (if subsidy is based on vehicle-kilometers/-hours), or to be strict in defining eligible trips. Third, there are few incentives to provide high quality service, and unfair competition to other service providers (who do not receive a subsidy) may cause difficulties.

A user-side subsidy, on the other hand, is a subsidy provided to the user, and thus, is based only on trips made. The advantages are:

- Control of who uses the program and for what trip types;
- The subsidy dollars are spent as trips are made; the subsidizing agency (MTC) does not spend any funds for unused capacity or service;
- Depending on how the subsidy is distributed, there is little administration required; and
- Better service can be provided, especially if several carriers are authorized.

Several subsidy mechanisms are possible with a user-side subsidy program. The most commonly used systems (in the U.S.) include scrip systems, coupon (or ticket) systems, voucher systems, or cash payment systems. These are described next.

Scrip: Booklets of "scrip" (something like Canadian Tire money) good for fare payment to authorized service providers are sold to eligible users at a fraction of their value (the fraction determines the level of subsidy, and is suggested at 10%; this means an eligible user would pay $1 for a booklet worth $10 of script). A monthly maximum could be imposed to provide incentives for frugal use of the scrip. The designated carrier would then "cash" the script with the issuing municipality for its full value, along with a percentage for added administration and handling. Such a system allows for good control over subsidy cost (by selling a limited amount, or by adjusting the price of scrip), and control of who uses the program and at what level of subsidy. The system is simple to administer and flexible in nature. Disadvantages of the system include the need for a coordinating body (possible contracted by MTC) responsible for printing and issuing scrip, and potential black market sales.

Coupon (ticket): In this system coupons are sold to eligible users. Each coupon entitles the user to a one-way trip at a fraction of the charge up to a certain dollar limit. Service providers redeem coupons for a set reimbursement per coupon. This system is best suited for use with providers who charge fixed prices per trip (taxis who charge a flat rate, or a rate based on zones).

Voucher: After a user-side subsidy trip is made, the taxi driver completes a voucher for the subsidized portion of the trip cost (in this case 90% up to a limit), with the balance being paid by the user. Completed vouchers would be submitted to MTC, or it's agent, which would then reimburse the taxi company for the voucher amount. Voucher systems are best suited for programs with relatively few providers and users - when the high administrative costs associated with the other systems cannot be justified. They are also well suited for use with variable fare service. However, potential disadvantages involve forged vouchers, users unable to sign their name to verify the trip, and additional administrative burden on the service providers.

Cash Payment: MTC, or it's agent, distributes cash payments directly to eligible users for transportation on any mode using any carrier. Although such a system is extremely simple to administer, and total costs are easily controlled, there is no assurance that the subsidy will be used for the intended purpose.

(7).4 RELEVANT CURRENT INITIATIVES

Relevant current initiatives:

- Paratransit Service (E.1.1);
- Taxi Regulation (E.3.2);
- Vehicle Acquisition Assistance and Tax Rebates (E.2.1, E.2.2);
- Experience in Calgary, Quebec City, Danville, Vancouver, Hamilton, London (U.K.) (G.2, G.3, G.5, G.6, G.14, G.15).

(7).5 TOTAL MARKET SERVED

It is assumed that this option is pursued in conjunction with the expanded eligibility (Option (6)). If all additional registrants are served by the new taxi service, 24,200 will benefit. However, introduction of the taxi service will take time, and for the first few years of the service a 25% penetration (of specialized transit ridership) is assumed, or 19,300 users. At 31.5 trips/year/user, this corresponds to a total of 610,000 trips per year.

(7).6 MARKET NEED SERVED

(As per Option (6).)

(7).7 TOTAL COST

Costs are grouped into two: administration costs, and variable costs. It is assumed that start-up costs (which include system planning, office organization and management procedures) are minimal, and are included in the administration costs. Administration costs include items such as labour, overhead, office rental/supplies, promotion and training. A per trip figure of $2.00 is estimated for these costs, based on data in the U.S. and applied to this program. This cost would be considered in the subsidy to the taxi company, and would also help to defray the extra time required to boarding/deboarding disabled passengers.

Variable costs are based on fares only, which are assumed to vary with distance travelled. The average trip length is assumed to be 5.7 kilometers (based on km/pass-trip for specialized transit). At $0.90 per kilometre for taxi fare, on average, variable cost is approximately $5.00 per trip.[26] Thus a total taxi cost of $7.00/trip is assumed.

This option results in a cost saving. Each taxi trip provided "replaces" a specialized transit van trip, or saves ($15.75 - $7.00 =) $8.75. At 610,000 trips per year, this gives a total saving of $5.3M/year ($4.8M/year excluding fares). MTC will receive 50% of this benefit, or a $2.7M/year saving. The 1996 saving to MTC is $5.1M/year, and the total savings over 30 years are $50M.

(7).8 UNIT COSTS

Based on the $2.00 per trip costs for administration and extended operation, total unit costs would be approximately $7.00 per passenger-trip (1986), which compares favorably with specialized transit at $15.75 per passenger-trip [16]. The savings for governments (i.e. when fares are excluded) are $6.40/trip.

(7).9 QUALITY OF SERVICE

Taxi travel has a high quality of service, especially with respect to physical comfort and dignity. In some cases, depending upon the operator, mental discomfort may exist. A wheelchair user may prefer transit which allows him to remain in his chair. If accessible taxis are incorporated into the system, then a high quality of service should exist for the entire target group. (See Option (8).)

(7).10 LEVEL OF SERVICE

Generally speaking the level of a taxi/van service compared with other modes is quite high. Some of the reasons for this high quality are as follows:

- The service is generally available most hours of the day (24 hours per day in large centres);
- Travel time is very fast relative to most modes;
- Cross-boundary travel is not an issue;
- Door-to-door service is provided; and
- Reservation times are minimal, and demand-response trips are feasible for the ambulatory.

---

[26] Of the special transit services in 1985, passenger trips were made by taxis (about 6% of total special transit passenger-trips) at a total cost of $440,000 or an average cost of $4.20 per trip (Ref. 94).

(7).11 DEVELOPMENT RISK

The development risks associated with demand and cost estimates can be overcome by periodic changes in subsidy level to control the program budget. A tightening of the eligibility criteria is also an option that can be used to control costs. Also, taxi services are inherently demand responsive, so that excessive capital purchases will not be made.

A significant risk (which has been experienced in the U.S.) is that paratransit operators may insist that taxi drivers become unionized, and the cost of taxi trips would become significantly higher.

(7).12 OPERATOR'S MANDATE

It is certainly within the mandate of taxi companies to transport disabled persons.

Although transporting disabled persons is within the mandate of MTC, it is not within their current mandate to administer scrip or to be involved with a user-side subsidy program. Jurisdiction may overlap with social programs. It is important that this jurisdictional overlap be resolved.

(7).13 SYSTEM COMPATIBILITY

This option could be pursued in conjunction with the vehicle subsidy options. This overlap could occur if eligibility under the two personal vehicle options is extended to both drivers and passengers of automobiles. (See Options (3) and (4).)

It is assumed disabled drivers would prefer to drive if they had a car, and thus would not have the same need to participate in this user-side subsidy program for taxi service. However, if eligibility (of the automotive option) is open to passengers, then as there is a high level of reliance on others to drive the car; in this instance the passenger may prefer to use a taxi.

If both a user-side subsidy option and a vehicle subsidy option were implemented, eligibility criteria for both must be rationalized in a coherent fashion (so that individuals do not receive the maximum subsidy for both).

The option also has potential overlap with the coordination or brokerage of special services. See Option (10) for the urban centres, and Option (2) for the GO area.

(7).14 SAFETY CONSIDERATIONS

There are no safety concerns in the proposed scheme.

(7).15 PUBLIC ACCEPTABILITY

The general public may perceive that they are "getting a raw deal" by paying full fare for the same service which a disabled person receives for $1 or so. This perception could be dissipated by an information campaign explaining the costs of the alternatives, and the rationale for program.

(7).16 HUMAN RIGHTS IMPLICATIONS

The proposed initiative has positive human rights implications, as it supplies excellent transit service to the disabled community, in a relatively integrated manner.

(7).17 SUMMARY

The pros of this initiative are:

- The overall costs of specialized transit are reduced;
- It frees specialized transit service for those who must stay in their wheelchairs.
- A high level of service is provided to those who require a door-to-door service;
- The specialized transit system becomes more demand responsive;
- Travel between municipalities and regions is facilitated; and
- The system uses existing resources in a "free-market" system.

The cons of this system are:

- Possible fraudulent use of the system.
- Some taxi companies may be reluctant to participate due to fear of increased administrative costs. (It is estimated that increased ridership will offset these costs.)
- For some persons in a wheelchair, the effort to get in and out of a taxi is considerable (except if fully accessible taxis are brought into the systems); and
- Perception by the general public of a superior service at minimal cost (high subsidy by taxpayers).

OPTION (8) ACCESSIBLE TAXI SUBSIDIES

(8).1 SECTOR

- Urban.

(8).2 TARGET GROUP

- Those eligible for specialized transit, who are also non-ambulatory.

(8).3 DESCRIPTION

If taxis are to asked into the paratransit market (as proposed in Option (7) above), some "sweetening of the pot" may be required. In the above program, initially, specialized transit vans would carry non-ambulatory travellers, but, over time, accessible taxis could be effectively utilized. The high-top, ramp-equipped Yellow Cabs of Vancouver Taxi have been tremendously successful, providing trips not only to wheelchair users, but the general public as well[27].

This option proposes the subsidy of 50% of the initial cost of an accessible taxi[28] for urban cab companies. Such taxis would be put into regular operation, serving disabled passengers if-and-when required. Certain standards would be attached to the subsidy, such as priority to disabled customers. To reduce financial risk to the government, maximums, in terms of subsidized amount per taxi and number of cabs per company, could be established.

(8).4 RELEVANT CURRENT INITIATIVES

Relevant current initiatives:

- Paratransit Service (E.1.1);
- Taxi Regulation (E.3.2);
- Vehicle Acquisition Assistance and Tax Rebates (E.2.1, E.2.2);
- Experience in Calgary, Quebec City, Danville, Vancouver, Hamilton, London (U.K.) (G.2, G.3, G.5, G.6, G.14, G.15).

---

[27] People carrying large items such as house plants are particularly fond of these taxis.

[28] The program could be implemented through other types of subsidies such as tax rebates, licencing grants or accessible equipment subsidies.

(8).5 TOTAL MARKET SERVED

Under the broad eligibility guidelines established in Option (6), there will be 77,200 registered specialized transit users. 18,000 of these registrants require lifts.[29] As in Option (7), we assume the accessible taxis to have a 25% penetration rate, giving a total number served of 4,500.

(8).6 MARKET NEED SERVED

This option helps the non-ambulatory specialized transit users. If each user travels 31.5 times per year, the total trips served is 142,000/year.

Note that this gives an average of 7 trips/day/operator.[30]

(8).7 TOTAL COSTS

As shown above, most taxi operators will require only one taxi; others will require several. We have assumed a purchase of 90 cabs,[31] each valued at $25,000.

TABLE (8).1: COST OF ACCESSIBLE TAXI SUBSIDY

Number of cabs purchased		90
Cost/cab	*	$25K
Subsidy/cab	*	50%
Life of cab	/	6 years
Total cost (to MTC)		**$188K/yr.**

The other 50% of the cab cost will be assumed by the taxi company, and integrated into its regular fare structures.

---

[29] According to CUTA and MTC, 30-40% of the 1985 registrants use wheelchairs, or (35% of 50,500) = 17,700. (This remains the same despite expanded eligibility.)

[30] Based on 142,000 trips/year for 55 municipalities (in 1986).

[31] Based on one cab for one half of the municipalities, two cabs for one quarter of the operators and three cabs for one quarter of the municipalities.

If the subsidy scheme is maintained after the first 6 years, the 1996 costs (accounting for inflation and population growth) will be approximately $400,000/year for MTC. The total 30 year cost is $2M.

(8).8 UNIT COSTS

This option provides 140,000 trips/year at a cost of $190K/year, or a unit cost of $1.40/trip.

(8).9 QUALITY OF SERVICE

Taxi travel has a high quality of service, especially with respect to physical comfort and dignity. In some cases, depending upon the operator, mental discomfort may exist. This option benefits wheelchair user who may prefer transit which allows him to remain in his chair.

(8).10 LEVEL OF SERVICE

Generally speaking the level of a taxi/van service compared with other modes is quite high. Some of the reasons for this high quality are as follows:

- The service is generally available most hours of the day (24 hours per day in large centres);
- Travel time is very fast relative to most modes;
- Cross-boundary travel is not an issue;
- Door-to-door service is provided; and
- Reservation times are minimal, and demand-response trips are feasible for the ambulatory.

(8).11 DEVELOPMENT RISK

The development risks associated with demand and cost estimates can be overcome by periodic changes in subsidy level to control the program budget. Also, taxi services are inherently demand responsive, so that excessive capital purchases will not be made.

(8).12 OPERATOR'S MANDATE

It is certainly within the mandate of taxi companies to transport disabled persons. In some senses this option is merely an extension of current policy (for specialized service) to the private sector.

(8).13 SYSTEM COMPATIBILITY

The option also has potential overlap with the coordination or brokerage of special services. See Option (10) for the urban centres, and Option (20) for the GO area.

(8).14 SAFETY CONSIDERATIONS

There are no safety concerns in the proposed scheme. Note that tie-downs will be required in the accessible cabs.

(8).15 PUBLIC ACCEPTABILITY

The general public may perceive that they are "getting a raw deal" by paying full fare for the same service which a disabled person receives for $1 or so. This perception could be dissipated by an information campaign explaining the costs of the alternatives, and the rationale for program.

(8).16 HUMAN RIGHTS IMPLICATIONS

The proposed initiative has positive human rights implications, as it supplies excellent transit service to the disabled community, in a relatively integrated manner.

(8).17 SUMMARY

The pros of this initiative are:

- The overall costs of specialized transit are reduced;
- It frees specialized transit service for those who must stay in their wheelchairs.
- A high level of service is provided to those who require a door-to-door service;
- The specialized transit system becomes more demand responsive;
- Travel between municipalities and regions is facilitated; and
- The system uses existing resources in a "free-market" system.

The cons of this system are:

- Some taxi companies may be reluctant to participate due to fear of increased administrative costs. (It is estimated that increased ridership will offset these costs.)
- Perception of general public of a superior service at minimal cost (high subsidy by taxpayer).

OPTION (9) COORDINATED PARATRANSIT SERVICES

(9).1 SECTOR:

- Urban.

(9).2 TARGET GROUP:

- Those unable to use public transit; paratransit users.

(9).3 DESCRIPTION

This initiative is motivated by the contradiction presented by over booked specialized transit services and under-used private agency vans. In some urban centres there is significant overlap in service between non-transportation agencies (volunteers, institutions, March of Dimes, etc.) which operate paratransit systems to serve their clientele, and municipally run specialized transit.

Coordination of these multiple services would collectively pool their resources. Shared vehicles would provide a more flexible and united transportation service, and reduce deadheading. A shared dispatch or brokerage system, facilitated by a computer[32] is a proven method of providing more trips to more people, at less cost, with lower waiting times. The sharing of maintenance facilities and other "overhead" items would contribute to cost savings.

The brokerage principle has been effectively implemented in Canada, the United States and some European countries, particularly in Sweden. There are at least 12 urban areas in Ontario which are could benefit[33].

If taxi companies become involved in paratransit service (as suggested in other options), they too could be part of a coordinated paratransit system.

Since the early 70's, demand for access to transportation services for elderly and disabled persons has been growing. Where public transit systems have been unable to provide service, separate paratransit operations have sprung up. Some have been planned and managed under municipal auspices; others have been created to serve the unmet needs of small organizations, agencies or communities. Often, larger specialized transit operations are over-booked and underfinanced, with demand for trips outstripping resources. WheelTrans (Toronto), on the other hand, special small agency vans are expensive to purchase and are often underused.

---

[32] Computerized dispatch systems are currently available on the market.

[33] The 12 Ontario urban areas which have multiple paratransit services are: Durham, Halton, Hamilton/Wentworth, Kitchener/Waterloo/Cambridge, Kingston, Ottawa/Carleton, Sarnia, Toronto, Thunder Bay, Timmins, Windsor and York. However, Hamilton, Ottawa and Toronto already have computerized dispatch systems.

Many non-transportation agencies (government and private) operate special systems to serve their clientele, alongside municipally administered specialized transit and taxi services etc. This overlap in service results in gross inefficiencies in many centres in Ontario. Some of these overlapping services include:

- School busing (Ministry of Education);
- Health and social service agency vans (Ministry of Community and Social Services);
- Ambulance services and Red Cross vans (Ministry of Health);
- Private service club vans (Rotary, Kinsmen, Lion's Club, etc.);
- Services provided by organizations for the disabled (Multiple Sclerosis, Canadian Paraplegic Association, etc.);
- Institutionally-based vehicles; and
- Taxis.

As mentioned above these paratransit services are restricted to only their clientele. A coordinated system would collectively pool the resources of the above services and thus offer a more flexible and efficient transportation service.

Recently, with the advent of micro-computer software to the market, new co-ordinated dispatch systems have become a low cost option for rationalizing transportation planning within a municipality or region. These new computerized dispatch systems become a cost-effective way of providing more trips to more people, at less cost, with lower waiting times, and elimination of trip prioritization. All vehicles participating in the system are on call during all hours of operation for all registered users of the system. By sharing their vans with others, the small agencies benefit from the capacity of a larger system to provide their members with more trips to more places at the time of their choosing. Often a brokerage system can extend hours of service to include Saturday and Sunday. The geographic area to be covered can also be extended to include suburban and some rural service if the number of participating operators is large enough.

The brokerage principle has been successfully implemented in Canada, the US, and in some European countries, particularly Sweden, as a way of reducing the costs of paratransit and increasing **efficiency** and **effectiveness** of transportation services for elderly and disabled persons. There are several urban areas in Ontario which could benefit from computerized scheduling and dispatch systems.

Both financial and operational considerations are important when setting up a coordinated system. A financial agreement must be negotiated between all independent operators before any operational decisions can be made regarding the scheduling and computer dispatch system to be used.

The financial agreement (contract) set-up between all transportation providers (government, private associations, clubs, etc.) would establish a cooperative, cost-sharing paratransit structure whereby operators agree to work together to provide service to all riders over an entire area. This would be a financial agreement between operators whereby operating, maintenance and replacement costs could be shared. In return, vehicles which might remain idle for a part of each day would be utilized more effectively to reduce waiting lists, trip priority and waiting times.

The above discussion deals with shared paratransit services, but taxi companies could also be involved in this coordinated system. If taxi companies are available and are interested in joining the system, eligible customers would then be issued tickets or coupons which would entitle them to taxi trips at standard bus fares. Each trip would be recorded by the driver, who then submits his accounts chits for reimbursement, from the broker at the end of the month. (See Option (7).)

Operational brokerage involves upgrading the scheduling and dispatch systems through the use of computers, which can process scheduling information very quickly. Dispatching can be made more efficient through the use of two-way radio communication.

A step by step plan which might be used to introduce a coordination demonstration project to Ontario is as follows:

1. A site should be chosen for a demonstration project and a complete inventory of current resources, costs, levels of service, etc. recorded.

2. All ministries, municipal officials, operators, agencies, associations and consumers be approached by MTC to cooperate in setting up this project. This will involve tendering service contracts.

3. Negotiations of a financial contract between operators spear-headed by MTC.

4. Appoint the scheduling and dispatch contractor, secure a suitable facility to accommodate the administration and operation of the brokerage system, acquire the necessary mobile radio system and license, finalize a maintenance and fueling arrangement, obtain insurance and establish scheduling and dispatch procedures.

5. Resolve geographic area to be served which would include suburban, rural service on an experimental basis, and determine eligibility requirements.

6. Market the brokerage operation. Because of the need for cooperation and financial support from other governmental ministries and municipalities, this project should be given a high political profile which would involve ministers, senior officials, media, other interest groups and associations.

7. Once the service is in operation, monitor progress very closely to measure changes in efficiency, etc.

8. Summarize what was learned as a model or case study for future projects.

9. Develop a funding program for start-up costs that encourage participation but not dependency.

10. Choose other regions of the province, and set-up a further controlled demonstrations. Repeat the above steps for the various locations with different populations until a satisfactory model has been developed and an appropriate funding mechanism devised.

Each of these areas will have different demand characteristics, and thus different costs associated with the implementation of this option. The Ottawa/Carleton region has been focused upon as an initial test site, and thus the demand and costs pertain solely to this city.

(9).4 RELEVANT CURRENT INITIATIVES

Much can be learned from the coordinated initiatives in Vancouver and Edmonton. These initiatives should be studied in depth before MTC embarks on a similar type of coordinated system for Ontario. See Appendices E.2.10, G.I.5.

The integrated paratransit/taxi services of Calgary, Quebec City, and Hamilton are also relevant. (See Appendices G.2, G.3, and G.14.)

(9).5 TOTAL MARKET

Geographic areas have been identified as being able to support a coordinated special transit system. This assessment has been based on multiple specialized transit systems existing in these areas. These geographic areas are listed below:

(i) Regional Municipality of Halton Hills;[34]
(ii) Regional Municipality of Durham; [34]
(iii) Regional Municipality of York;[34]
(iv) Metro Toronto;[34]
(v) Kitchener/Cambridge/Waterloo;
(vi) Hamilton Wentworth;[34]
(vii) Kingston;
(viii) Ottawa/Carleton;
(ix) Sarnia;
(x) Thunderbay;
(xi) Timmons;
(xii) Windsor.

---

[34] These municipalities are also considered in the GO area Options (20, Specialized Inter-Jurisdictional Service).

It is estimated that 100,000 persons in Ontario benefit from paratransit services (approximately double the number registered for the municipally-run specialized service). Coordinated systems would reach 50%[35] of these individuals. This gives a market served of 50,000 people.

The estimated operating cost of the 1986 Ontario specialized transit system (under the expanded eligibility option) is \$27M/year[36].

(9).6 MARKET NEED SERVED

This initiative addresses the same market as presently served; in the case of municipally-run specialized transit, those unable to use public transportation; in the case of other paratransit service providers, various disability groups.

The option does not change the existing market served, it increases the existing level of service.

(9).7 TOTAL COSTS

It is extremely difficult to cost this option, yet experience has shown that a cost savings will result with implementation of a brokerage/coordination system, as the cost associated with the brokerage function is relatively low (a computer dispatch system costs \$200,000). For instance the Edmonton Brokerage/Coordination project suggests that the aggregated net cost (total operating costs less revenue) across the system will decrease by 9%. This represents a substantial savings in operational costs. Although this cost savings percentage of 9% is specific to the Edmonton experience, it can be used to approximate cost savings for various municipalities in Ontario.

TABLE (9).1: TOTAL COST SAVINGS DUE TO COORDINATION OPTION

Gross operating cost		\$27M/yr.
Net operating cost (92% of gross)		\$25M/yr.
Percentage of population covered	*	50%
Savings (on operating cost)	*	9%
Total savings		**\$1.1M/yr.**
MTC share		\$0.56M/yr.

---

[35] Based on a 50% of those in the larger centres on the list (Toronto, Ottawa and Hamilton) and 100% in the smaller centres.

[36] From Table E.1, and Option (6).

In 1996 values, the savings are $2.0M per year (excluding fares) and the MTC savings are $1.2M. Over 30 years, the total savings are $10M (in present valued 1986 dollars).

(9).8 UNIT COSTS

The key to lowering the net cost/trip for the entire system is to broker a greater proportion of the ambulatory trips to non-lift equipped vans. This becomes obvious when studying Table (9).2 below which illustrates the cost per trip and cost per hour for the various service modes under the Edmonton brokerage system. This table also illustrates the unit costs associated with the scheduling and dispatch service as well as the fuel/maintenance contracts.

TABLE (9).2: DATA FROM EDMONTON'S BROKERAGE SYSTEM

Item #	Contract Function	Cost Per Trip	Cost Per Hour
1.	Hourly Lift Equipped Service	$ 14.10	$ 26.95
2.	City Owned Fleet	12.64	27.13
3.	Hourly Sedan Service	7.85	15.98
4.	Airport Limousine, Caravan Cab, Cab, Flatbed sedan and van service	6.75	-
5.	Scheduling & Dispatch contract	1.08	2.33
6.	Fuel and Maintenance	4.64	8.83
7.	Administration	1.30	2.80
8.	**Total** (ave. of 1-4, plus others)	**$ 11.83**	**$ 24.37**

In reference to the Edmonton experience, a comparison to the quarter preceding the brokerage/coordination system, shows the average cost/trip across all modes was reduced by 14%, which represents $1.62 reduction/trip.

For the Ontario system, the coordination function is assumed to affect 50% of the trips taken:

TABLE (9).3: TOTAL TRIPS FOR THE COORDINATION OPTION

Total users		50,000 users
Total trips/user	*	31.5 trips/yr/user
Percentage of trips affected	*	50%
Total trips		788,000 yr.

At a cost saving of $1.1M/year, the unit cost saving is $1.40/trip or $1.29/trip if fares are excluded.

(9).9 QUALITY OF SERVICE

This initiative has no effect on the quality of service. Generally, the quality of service for special transit service is high, as the passengers are comfortable and maintain self-respect throughout the trip.

(9).10 LEVEL OF SERVICE

The level of service would vary with each of the operators under contract. The service level is expected to increase in the following ways:

- Number of trips per hour by vans with lifts will increase;
- Faster service;
- Decrease in waiting time, priority difficulties and waiting lists;
- Number of trips increased;
- Larger geographic area served;
- Increased hours of service.

These increased service levels will result in high user satisfaction.

(9).11 DEVELOPMENT RISK

By implementing this initiative to one municipality or region at a time the developmental risks are minimized. Several other considerations indicate low risk:

- Initial costs are not high; and,
- Existing programs have been successful.

One potential obstacle to coordinated services is resistance on the part of the existing service providers, as they may prefer a decentralized approach based on their own eligibility and service criteria. The program is very dependant upon the cooperation of many groups: MTC, COMSOC, Ministry of Education, Health the municipal operator, the private operators, and users.

(9).12 COMPATIBILITY WITH OPERATOR'S MANDATE

Strictly speaking, this option is outside the mandate of MTC. The municipalities administer, and (in many cases) run, the "public" specialized transit services, and have no direct control of private services. MTC's role would be to sponsor demonstration programs to subsidize some of the start-up costs, and to act as an information/advisory service. The municipalities and private operators would have to work together closely to develop and administer the service.

(9).13 SYSTEM COMPATIBILITY

The essence of this option is to make existing paratransit services compatible, and to improve vehicle utilization.

With regards to other transportation options, this option could be integrated with the user-side subsidy of taxis (see Option (7)), and revised paratransit eligibility (Option (6)).

(9).14 SAFETY CONSIDERATIONS

There are no safety considerations beyond the existing paratransit and public transit guidelines.

(9).15 PUBLIC ACCEPTABILITY

There would be no concerns from the public point of view.

(9).16 HUMAN RIGHTS IMPLICATIONS

There are some human rights implications, as this option does not improve the accessibility of public transit systems. It improves upon (and promotes) the use of current specialized transit.

(9).17 SUMMARY

The advantages of this option are:

1. The overall costs of paratransit services are reduced.
2. It increases the level of service (number of trips, area served, efficiency. etc.).
3. Initial costs are distributed among several agencies and associations.
4. The service can be extended to rural communities surrounding an urban centre.

The potential disadvantages of this system are:

1. Significant cooperation between many parties is required: municipal operators, private operators, users, the MTC and other government ministries. There may be difficulty in persuading agencies, associations and service clubs to sacrifice independence in favour of cooperative partnership.
2. Paratransit operators may feel that addition of taxis in the system will result in a loss of business.
3. Some taxi companies may be reluctant to participate due to fear of increased administrative costs. (It is estimated that increased ridership will offset these costs.)

OPTION (10) CROSS-BOUNDARY TRAVEL SERVICE ENHANCEMENT

(10).1 SECTOR:

- Urban.

(10).2 TARGET GROUP

- Those unable to use public transit; registrants for specialized.

(10).3 DESCRIPTION

Travel across municipal boundaries is not an option for many specialized transit registrants. This is due to one of two factors:

(i) A transfer must be made at the boundary line, which is difficult or impossible due time constraints, lack of transfer point and/or the lack of scheduling between the two operators; or,

(ii) There is no service in the adjacent municipality.

Either of these problems would be solved if the specialized transit van drove directly to the destination in the bordering jurisdiction. The principal reason this does not happen (i.e. the actual cause of the problem) is that the operators are not **subsidized** for these trips. Other reasons include varying **eligibility** practices and lack of **coordination** between municipalities.

The province has already revised its specialized transit policy to encourage cross-boundary **coordination**. The revision of **eligibility** criteria (as proposed elsewhere) contain an element of standardization. MTC could provide grants and technical assistance to municipalities to plan their cross-boundary coordination. The final step to solving this problem is for the provincial and municipal governments to allow enough funds for the **subsidization** for cross-boundary travel.

(10).5 TOTAL MARKET

All specialized service registrants will (potentially) cross municipal boundaries. For the expanded eligibility criteria, this represents 77,000 people.

(10).6 NEED SERVED

The Halton Regional study [20] showed that 0.076 cross boundary trips/day are desired by disabled travelers. With an average of 0.95 trips/day total [Ref 13, U.S. Data], this corresponds to 8% of all trips being cross-boundary.

As shown in Option (6), the total annual trips on specialized transit are 2,430,000. 8% of this is 195,000 trips per year.

(10).7 NET COSTS

It is assumed that cross-boundary trips will be, on average, 50% longer than intra-municipal trips, and thus 50% more expensive. It is also assumed that 65% of all cross-boundary trips are provided by taxis (the ambulatory portion of the registrants). These two factors give an average unit cost of $15.20/trip, $14.40/trip if fares are excluded.

(10).8 TOTAL COSTS

195,000 trips/year, at a cost per trip of $15.20, gives a total cost for this option $2.95M/year (excluding fares). MTC's share would be 50%, or $1.5M/year.

In 1996, accounting for inflation and population growth, the cost will be $5.5M per year, with MTC sharing $2.9M per year. The total 30 year cost (in 1986 dollars) is $29M.

(10).9 QUALITY OF SERVICE

This initiative would have no effect on the quality of service provided.

The quality of service of specialized transit is quite high; however it is not as high as the taxi and automotive options. The passenger is still able to maintain self respect throughout the trip.

(10).10 LEVEL OF SERVICE

The level of current specialized transit service may deteriorate if the number of trips is expanded. For instance, new vans will be bought over time to meet the rising demand. As this increase in the fleet is reactive, lag periods, when the demand cannot be met, may occur. These lag periods may result in high waiting periods and/or poor levels of service.

However, if the taxi initiatives of Options (7) and (8) are pursued in conjunction, levels of service may improve.

(10).11 DEVELOPMENT RISK

The take up of specialized cross-boundary transit is hard to predict. Therefore lower level of service and higher costs may result if more people travel than expected.

(10).12 COMPATIBILITY WITH OPERATOR'S MANDATE

Definition of specialized transit subsidies is the prerogative of MTC, however coordination of cross boundary trips is left up to the municipalities.

(10).13 SYSTEM COMPATIBILITY

Specialized transit services generally run door-to-door, so that interface with other modes is not an issue. Cross-boundary problems are an issue and can be attributed, in part, to differing application of eligibility criteria by different municipalities. This problem would be solved by a consistent province-wide eligibility definition.

(10).14 SAFETY CONSIDERATIONS

(Not an issue.)

(10).15 PUBLIC ACCEPTABILITY

(Not an issue.)

(10).16 HUMAN RIGHTS CONSIDERATIONS

The longer term question of integration must be addressed. However, it is generally accepted that there will always be a need for some specialized door-to-door transit, even if public transit is made fully accessible.

(10).17 SUMMARY

The advantages of this change in eligibility are:

- Subsidy dollars are put towards helping more users of specialized transit;
- Higher utilization of vehicles.

The disadvantages of this change in eligibility:

- Will cost MTC $1.5 million in extra subsidies;
- Avoids the longer term question of integration;

URBAN AREA OPTIONS
PUBLIC TRANSIT

OPTION (11) PUBLIC TRANSIT DESIGN IMPROVEMENTS FOR AMBULATORY PASSENGERS

(11).1 SECTOR:

- Urban.

(11).2 TARGET GROUP:

- Those who use public transportation with difficultly.

(11).3 DESCRIPTION

A significant number of disabled persons use public transit, but with difficulty. The objective of this initiative is to ensure that all public transit in Ontario will eventually become easier for the ambulatory disabled to use. The underlying principal is that, with a relatively small effort in equipment installation and operational policy, the **quality** of service in buses, subways, trains, etc. will be improved.

Many operators in Ontario presently claim to have programs and budgets for this sort of initiative; several are instituting their programs in a rigourous fashion. However, with no budgets or deadlines, many apply their programs on an ad-hoc basis.

The proposed initiative would require all transit operators to submit a specific plan of action to MTC. Funding **of any sort** from MTC would be contingent upon approval of the plan.

The type of equipment of interest here might include:

At stations or stops:

- tactile floors; tactile cues
- curb cuts;
- door modifications;
- shelters;
- benches; resting rails;
- high contrast, large-lettered signage and schedule information; pictograms;
- stairway handrails;
- improvements to subway PA system;

On vehicles:

- special courtesy seating markers;
- grab bars, poles, hand holds;
- high contrast, large lettered signage;
- visual cues on steps;

- tactile flooring, especially on steps;
- delayed door closing.

Several initiatives in the service area would aid disabled users:

- a special information network, including telephone service, special schedules;
- operator awareness programs (initiating various rules such as seating before acceleration, calling all stops, aid policies);
- special service (wait time, routing deviation) to institutions, etc.;
- enforcement of special seating.

Costs to MTC could be partially defrayed through a sponsorship program, whereby private sector can have their name embossed on the equipment they subsidized (shelters, benches, etc).

(11).4 RELEVANT CURRENT INITIATIVES

- Capital retrofit subsidies (Appendix A.1.3).
- PST exemptions - equipment (A.1.4).
- GO Transit (A.1.8).
- Safety Inspection programs (A.1.2).
- Terminal Upgrades (A.2.6).
- VIA Rail Upgrades Standards (A.2.).

(11).5 TOTAL MARKET SERVED

The CHDS [2] shows that 565,000 disabled persons in Ontario in 1983 had public transit available. In Section 4.1 of the Main Report it was established that 22% of the disabled population have difficulty using public transportation. These figures give a number of 134,000 individuals who might benefit from upgrades to the public transit system (in 1986)[37]. Appendix C8.2 shows that these travellers would take 12.7 trips/month, giving a total of 20,400,000 trips/year.

(11).6 MARKET NEED SERVED

The proposed option would be especially beneficial to the disabled elderly (approximately 72% are in the target group), the hearing impaired (40% of which are in the target group), the vision impaired (23%), and mobility aid users (13%).

---

[37] Theoretically (according to the data development) this group includes those "unable to use public transit". In practical terms, the number who will benefit from public transit improvements could include those unable to use, if lifts were deployed. This group could also include the general public, who benefit from hand holds, tactile flooring, etc. The size of this group, if anything, is underestimated.

(11).7 TOTAL COSTS

The majority of the costs for this option relate to capital expenditures. These include expenditures for upgrades to buses, to bus stops and to stations. General system wide costs such as information dissemination, operator training etc. recur on an annual basis.

Table (11).1 identifies the major components of these costs. Vehicle upgrade costs are applied only to new vehicles (replacement vehicles and vehicles for growth of systems). Costs per bus stop vary from $400 to $1200, depending on whether or not they are sheltered. It is assumed that 10% of the stops will have a shelter, and all will have benches, hand holds, and signage. All stations will eventually be upgraded to include the items listed in the table.

Since a major portion of the costs are capital, expenditures are distributed over 20 years. Since new bus purchases for replacement are, by their nature, deferred over time, it is assumed that the other equipment will be distributed in such a way as to minimize total annual expenditures; that is, if a relatively large number of buses are purchased in any one year, then purchases of other equipment are reduced proportionately.

Bus purchases for replacement are cyclical, assuming an average life cycle of 18 years. However, because of a major bus purchasing spree in the mid 1970's (when the MTC subsidy program came into effect), a large number of replacement purchases are expected in the late '80s and early '90s. After the initial few cycles, however, replacement purchases should even out to about one eighteenth of the total fleet (which changes over time to include new bus purchases). New bus purchases grow at about 1.2% per year.

It is assumed that there are about five stops per directional roadway kilometre (includes both sides of the street). With approximately 12,870 kilometers of directional roadway served, there are an estimated 64,000 bus stops across Ontario. Assuming approximately 2.5 bus (transit) stations per system (and 72 (in 1986) systems across Ontario), there are about 177 stations in the province. It is assumed that capital expenditures related to stops and stations are non-recurrent over the 30 year costing period.

Average annual costs total $2,460,000 in the first years. In 1996, due to inflation, the average annual costs would be approximately $4,900,000 per year. MTC portion is slightly less. Beyond the initial 20 year period, annual costs would drop significantly due to few stop and station upgrades beyond this period (new stops and stations assume the same growth rate as new buses). It should be noted that the majority of the capital costs for the first 20 years stem from the cost of stop modifications. Total 30 year costs ($25.5M), and cost components are shown in Table (11)2.

(11).8 UNIT COSTS

Once fares are eliminated from the equation, unit costs are calculated as $0.12/trip. It is assumed here that, although upgrades are undertaken over a 20 year period, full demand starts from the first year. Thus cost per trip is under estimated slightly. Nevertheless, unit cost are extremely low, primarily due to the large number of users affected by the option.

TABLE (11).1: UPGRADE COSTS (INSTALLED)

		Assumptions
Per Vehicle Costs		
Hand holds 10 x 50	$500	All new vehicles:
Seating markers	100	
Signage	200	o for replacement
Visual cues	100	o for growth
Tactile flooring	500	
Delayed door closing	500	
	$1,900	
Per Stop		
Shelter	$ 800	10% of stops with shelters
Benches	100	5 stops/km (both directions) X
Hand holds	100	12,817 km = 64,000 stops
Signage	200	
	$1,200	
Per Station/Terminal		
Curb cuts 4 x 100	$ 400	
Door mods 5 x 500	2,200	
Benches, rails	1,000	All stations
Signage	1,000	2.5 stations/system X 70 systems
PA system	1,000	= 175 stations
Tactile flooring, cues	2,000	
	$7,400	
Per Operating System Per Year		
Marketing/brochures		$10K
Operator training 2 days x 20 persons		$5K
Service charges (rerouting)		--
Enforcement of seating		--
		$15K/station/year

TABLE 11.2: 30 YEAR NPV OF TOTAL COSTS

YEAR	---NUMBER OF BUSES--- REPL'NT	NEW	TOTAL	TOTAL BUS COST	# SYSTEMS UPGRADED	CUMULATIVE # SYSTEMS	TOTAL SYSTEM COST	# STOPS UPGRADED	TOTAL STOP COST	# STAT'NS UPGRADED	TOTAL STAT'N COST	TOTAL OPTION COS
1	150	70	220	418000	4	4	60000	4339	2082712	12	88800	2649512
2	200	71	271	514596	3	7	105000	3254	1562034	9	66600	2248230
3	250	72	322	611211	3	10	150000	3254	1562034	9	66600	2389845
4	250	73	323	612846	3	13	195000	3254	1562034	9	66600	2436480
5	300	73	373	709500	2	15	225000	2169	1041356	6	44400	2020256
6	350	74	424	806174	2	17	255000	2169	1041356	6	44400	2146930
7	400	75	475	902868	2	19	285000	2169	1041356	6	44400	2273624
8	450	76	526	999582	2	21	315000	2169	1041356	6	44400	2400338
9	350	77	427	811317	2	23	345000	2169	1041356	6	44400	2242073
10	300	78	378	718073	2	25	375000	2169	1041356	6	44400	2178829
11	250	79	329	624850	3	28	420000	3254	1562034	9	66600	2673484
12	250	80	330	626648	3	31	465000	3254	1562034	9	66600	2720282
13	200	81	281	533468	3	34	510000	3254	1562034	9	66600	2672102
14	200	82	282	535310	3	37	555000	3254	1562034	9	66600	2718943
15	200	83	283	537173	3	40	600000	3254	1562034	9	66600	2765807
16	150	84	234	444059	5	45	675000	5424	2603390	15	111000	3833449
17	200	85	285	540968	3	48	720000	3254	1562034	9	66600	2889602
18	150	86	236	447900	4	52	780000	4339	2082712	12	88800	3399412
19	200	87	287	544855	3	55	825000	3254	1562034	9	66600	2998488
20	250	88	338	641833	4	59	885000	4339	2082712	12	88800	3698345
21	300	89	389	738835		59	885000	879	422015	2	17709	2063559
22	300	90	390	740861		59	885000	890	427080	2	17921	2070862
23	250	91	341	647911		59	885000	900	432205	2	18136	1983252
24	350	92	442	839986		59	885000	911	437391	2	18354	2180731
25	320	93	413	785086		59	885000	922	442640	3	18574	2131300
26	330	94	424	806211		59	885000	933	447951	3	18797	2157959
27	350	95	445	846361		59	885000	944	453327	3	19023	2203711
28	320	97	417	791538		59	885000	956	458767	3	19251	2154556
29	330	98	428	812740		59	885000	967	464272	3	19482	2181494
30	350	99	449	852969		59	885000	979	469843	3	19716	2227528
NPV				6763766					14326203		610523	25541943
TOTAL #	8250	2510	10760		59			73282		202		

	LOW	HIGH
ESTIMATED ANNUAL DEMAND (000s)	4530	16117
ESTIMATED AVG. ANNUAL COST (000s)	2463	2463
NPV OF DEMAND OVER 30 YEARS (000s)	46978	167130
COST/TRIP (NPV OF TOTAL COST/NPV OF DEMAN	0.15	0.54

(11).9 QUALITY OF SERVICE

As described above, the essence of this option is to improve the quality of service of public transit. Nonetheless, even with these improvements, the quality of service on public transit must be considered less than for special transit, automobiles and taxis.

(11).10 LEVEL OF SERVICE

Public transit provides good level of service in most urban areas, it allows for spontaneous trip-making, and provides relatively speedy service. Depending upon the origin and destination, door-to-door service can be obtained in many cases.

(11).11 DEVELOPMENT RISK

There is virtually no risk in the proposed project. Existing retrofits have proven successful, and costs can easily be controlled via the existing subsidy guidelines.

(11).12 COMPATIBILITY WITH OPERATOR'S MANDATE

This program is totally compatible with the mandate of municipal transit operators.

An OUTA/MTC Task Force is currently considering this issue.

(11).13 SYSTEM COMPATIBILITY

This item is not applicable, as it will not change trip-making decisions significantly, only increase the quality of service.

(11).14 SAFETY CONSIDERATIONS

Although definitive statistics are not available, the improvements in vehicles, their operation, and stations, if properly designed can only serve to increase safety of public transit travellers (both the disabled and general public).

(11).15 PUBLIC ACCEPTABILITY

The proposed initiative would be of positive worth to the general public's view of public transit. In the odd case, delays to assist disabled or elderly passengers may create some impatience.

(11).16 HUMAN RIGHTS IMPLICATIONS

The proposed benefits, do not substantially change the users' transportation situation. Human Rights are not a major issue in this option,

(11).17 SUMMARY

The pros of this initiative are:

- It benefits many disabled travellers, at low cost;
- It involves integration of disabled travellers into the mainstream; and
- It allows for spontaneous trip-making.

The cons are as follows:

- The benefits are difficult to quantify;
- It does not increase the services or level of service for disabled travellers.

OPTION (12) ADDED TRAINING FOR MENTALLY DISABLED AND BLIND PERSONS

(12).1 SECTOR

- Urban.

(12).2 TARGET GROUPS:

- Mentally impaired and blind persons.

(12).3 DESCRIPTION

Some blind and mentally impaired travellers are unable to get to, or board, public transit, and are eligible for specialized service. Many of the remaining individuals in these groups use public transit with difficulty. However, automatically allowing all mentally impaired and blind persons onto specialized service, purely on the basis of their impairment, could swamp the system.

This option allows for the training of those mentally impaired and blind persons who are not eligible for specialized transit already, in the use of public transit services. One day courses are subsidized by the province, in local regions, possibly provided through user groups. These courses would focus on public transit specifically, and include the use of actual equipment. (Note that the CNIB already provide extensive training in independent living.)

(12).5 TOTAL MARKET

There are currently 25,000 mentally impaired and 14,000 blind persons in Ontario. It is assumed that, if training is offered, approximately one-half would take advantage of such a program, or 19,500 people.

(12).6 MARKET NEED SERVED

These persons would, as a result of training, travel on public transit at the same rate as other disabled persons, 12.7 trips/month (from Table C8.2-2). This corresponds to a total of 2,970,000 trips per year.

(12).7 TOTAL COSTS

The costs associated with such training are calculated below, based on 35 persons taking a one course, repeated every 5 years.

TABLE (12).1: COSTS FOR TRAINING OPTION

Item/Description	Calculation
Total persons	19,500
/Number persons per course	/ 35 per course
/Five year cycle time	/ 5 years
= Number of courses given/yr	= 111 courses/year
* Cost/course	* $1,500/course
= Delivery cost	= $167K yr
+ Course preparation cost	+ $30K/yr
= TOTAL COST	= $ 197K/yr

It is assumed that the provincial government bears 100% of these subsidies. The corresponding 1996 cost for this option is $400K/yr. Over 30 years, the total cost is $2M (1986 dollars).

(12).8 UNIT COSTS

At a total of $197k/year and 3M trips, unit costs are very low, $0.066/trip.

(12).9 -- (12).17 OTHER ITEMS

Similar to Options (1) and (11).

OPTION (13): ACCESSIBLE URBAN BUSES

(13).1 SECTOR:

- Urban.

(13).2 TARGET GROUPS:

- Those who are unable to board public transit.

This initiative involves equipping new urban buses with lifts. Two variations are studied: all buses made accessible, and 25% of all buses made accessible. In both cases, stops and stations are upgraded for complete accessibility. Specific analysis are developed for Ottawa (a large centre), and Belleville (a small centre). An aggregate analysis is developed for the province.

This option is evaluated primarily in order to compare its costs and benefits to other options under review[38].

(13).3 DESCRIPTION

Public transit is available to approximately 75% of Group A, 54% of the mentally impaired, and 67% of the visually impaired (figures for the legally blind are not available), yet only one fourth of these individuals actually use the service; and 50% to 70% have trouble using public transit, mostly with getting on/off the vehicle (Group A and mentally impaired have the highest incidence). It is this latter group that an accessible public transit system is intended to serve; it will **not** be of benefit to those who cannot get to the bus stop, nor to those who do not have public transit available (regardless of whether or not they can walk, climb or stand). This latter group is best served by special transit, if it is available.

To analyze this option, two urban centres are used as case studies: Ottawa, representing a large metropolitan area with a catchment of over one half million people, and Belleville, a small city, with a population of 35,300. Both cities have operate seven days a week; Belleville's conventional transit is in service six days, special transit for five days of the week. In addition, an analysis for all of Ontario is performed in an aggregate. Table (13).1 summarizes the relevant operational and

---

[38] Making local transit accessible fails to serve the most needy disabled travellers. Experience in the U.S. substantiates this statement. Many of those who are "unable to use" public transit cannot get to the stop. Door-to-door transportation is required. For most other disabled travellers, minor upgrades of vehicles and operating procedures will alleviate most difficulties (as described in Option 11.)

TABLE 13.1: CHARACTERISTICS OF CONVENTIONAL AND SPECIAL TRANSIT

	PROPERTY OWNER				
	BELLEVILLE		OTTAWA		ONTARIO
CHARACTERISTIC	CONV TRANSIT	SPECIAL TRANSIT	CONV TRANSIT	SPECIAL TRANSIT	CONV TRANSIT
SERVICE AREA (000s HECTARES)	2.4	3.1	38.0	34.0	1,287.0
POPULATION (000s)	35.4	35.4	538.0	538.0	6,218.0
POTENTIAL USERS (000s)	35.4	0.134	538.0	9.0	6,218.0
TOTAL PASS. (000s)	953.2	3.88	85,014.0	242.2	685,280.0
WHEELCHAIR		2.33		84.8	
AMBULATORY		1.55		157.4	
NO. OF VEHICLES					
PEAK SERVICE	7	2	708	36	3300
ACTIVE FLEET	17	2	800	38	4040
REV VEH-KM (000s)	612.8	27.0	39,886.0	2,250.0	226,532.0
REV VEH-HR (000s)	31.5	2.4	1,736.0	103.7	14,497.0
OP. COST (000s)	$1,173	$31.78	$93,789	$2,800	$784,304
OP. REVENUE (000s)	$654	$4.11	$54,352	$310	$494,724
FARE BOX	$618	$4.11	$52,656	$310	$470,305
OTHER	$37	$0.00	$1,696	$0	$24,419
NET OP. COST (000s)	$519	$27.67	$39,437	$2,490	$289,580
OP. COST/REV VEH-KM	$1.91	$1.18	$2.35	$1.24	$3.46
OP COST/REV VEH-HR	$37.24	$13.24	$54.03	$27.00	$54.10
OP. COST/PASS	$1.23	$8.19	$1.10	$11.56	$1.14
AVERAGE FARE	$0.65	$1.06	$0.62	$1.28	$0.69
AVG OPERATING SPEED	19.45	11.25	22.98	21.70	15.63

	PROPERTY OWNER		
	CONVENTIONAL TRANSIT		
CHARACTERISTC (continued)	BELLEVILLE	OTTAWA	ONTARIO
HEADWAY:			
PEAK	30 MIN.	6-10 MIN.	N/A
NON-PEAK	30 MIN.	10-15 MIN.	N/A
BUS ROUTES:			
REGULAR	9	60	N/A
EXPRESS		55	N/A
TRIPS/DAY	304	4000	56560
AVG. CYCLE	25 MIN.	113 MIN.	48 MIN.
BUS CAPACITY:			
GM STAND.	43-85	50-85	50-85
ARTICT'G	N/A	60-125	60-125
ORION 30'	N/A	31-55	31-55
FULL TRIPS:			
PEAK	90%	90%	90%
NON-PEAK	0%	0%	0%
STATIONS	N/A	14	277
STOPS:	550	5000	64000
BENCHES		547	N/A
SHELTERS		648	N/A

financial characteristics of the two transit systems for both cities, and of conventional transit for Ontario.

Ottawa has many features that provide assistance to those who have certain difficulties in using public transit. They have (as do many properties) priority seating near the entrance of the vehicle; a card is issued to those eligible. Special effort is provided (at the discretion of the operator) to assist those with moderate difficulty. Many bus stops already have benches (11%), or shelters (13%); and most transit stations are equipped with elevators, shelters and benches.

Belleville has some unique characteristics that help those with moderate difficulty, especially the frail and elderly. Like Ottawa, they have a priority seating arrangement on all buses, but these seats are higher, are tilted forward slightly, and are individual seats rather than bench seats. In addition to this, all of their new 40' ORION buses (four) are equipped with a similar "kneeling" feature to that of the ORION II. The buses "kneel" about 2.5 inches for those requiring the lower first step. Operationally, the feature has generated no problems, taking about two seconds each to lower and to raise, and requiring very little maintenance. The benefits of minor upgrades are described in more detail in option (11), Public Transit Design Improvements.

(13).4 RELEVANT CURRENT INITIATIVES

- Capital Retrofit Subsidies (E.1.3);
- Safety Inspection Program (E.1.2);
- PST Exemptions - Equipment (E.1.4);
- Terminal Upgrades (E.2.6);
- Public Transit Fare Reduction (E.3.3);
- Equipment Upgrades in Public Transit (E.3.4);
- Vancouver's Advanced LRT System (G.7);
- North American Accessible Public Transit System (G.10); and

(13).5 TOTAL MARKET SERVED

From estimates of the target population of the catchment areas (Belleville, Ottawa, and Ontario), several demand figures are calculated based on various sources. These are summarized in Table (13).2. The target populations, adjusted to 1986 figures, are 180, 2739, and 31,660 for Belleville, Ottawa and Ontario respectively. It is assumed that all of the catchment population has P.T. available, and therefore, so too does the target. As well, the incidence of the target population is

TABLE 13.2: DEMAND CHARACTERISTICS

DATA

	Belleville	Ottawa	Ontario
Basic Data			
Catchment Population	35,389	538,000	6,218,302
Conventional Vehicles	15	800	4,040
Target Population [1]	166	2,529	29,226
Conv Demand (Trips/Day)	3,055	232,915	1,877,528
Demand Estimates: [2] (Trips/Day)			
Low Demand	2.0	153	1,233
High Demand	3.8	290	2,336
Max Demand	14.4	1095	8,824
Comparative Data: [5]			
Trips/Target (Daily-All Modes)	0.768	0.768	0.768
Total Trips (Daily-All Modes)	128	1,942	22,446

SANITY CHECK

	Belleville	Ottawa	Ontario
Sanity Check 1:			
Existing Utilization: [3] (Trips/Day)			
25% of Fleet	0.9	40	202
50% of Fleet	1.8	80	404
100% of Fleet	3.6	160	808
Sanity Check 2:			
Theoritical Utilization: [4] (Trips/Day)			
Existing Trips	0.0	0	0
New Trips	3.6	55	638
Diverted Trips	8.9	135	1,559
Total Trips	12.5	190	2,197
Sanity Check 3:			
Paratransit (Trips/Day)	10.6	663	4,355

NOTES

1. Based on 0.47% of catchment population, Includes Group A, Mentally Impaired, Legally Blind but only those who have trouble getting on/off conventional P.T.
2. Max demand is based on non-disabled ridership incidence applied to the target population. (Ref. 22).

   High demand is based on use of special transit with 24 hour reservation (Ref. 22).

   Low demand is based on use of existing accessible fixed-route P.T. in the U.S. (Ref.22).
3. Based on existing use of accessible fixed-route P.T. in terms of number of lift-equipped vehicles (Ref. 84).
4. Based on analysis of latent demand and diverted trips as a percentage of current total trips of target gorup (all modes) (Ref. 84).
5. TRB Table 5 using "severely TH" and 56% availability of auto (CHDS Table C6.1).

assumed to be the same as Ontario urban. Finally, as described above, the target's difficulty using existing public transit is getting on/off the vehicle; it assumes that the target can get to the stop.

Demand estimates from two of the sources are based on the size of target population and one source basis uptake on the number of lift-equipped buses in the fleet. From the estimates, a high and low figure of daily trips is identified. After reviewing the results, it seems that the "best" values (most realistic) originate from the revised incidence of the Transport Canada study [18]. These figures use, as a basis, the incidence of transit use among the general public; this represents the maximum conceivable demand, with the low and high estimates being proportioned down accordingly. Since Ottawa has an exceptionally high per capita incidence of use of public transit, the target group is assumed to have a similarly high rate of use. This explains some inconsistencies (in proportion) among the results from the various sources; Belleville, with a lower incidence of use (per capita) shows a proportionately lower demand when compared to Ottawa (using ref. 22's incidence rates). Thus, the values that will be used in determining unit costs, in daily one way trips, are:

DAILY ONE WAY TRIPS

	LOW	HIGH
BELLEVILLE	2	4
OTTAWA	153	290
ONTARIO	1233	2336

The low and high values for Belleville compare closely to the incidence of existing lift utilization for 50% and 100% of the fleet made accessible (Sanity Check 1 in the table), respectively; they are, however, lower than the theoretical estimates of utilization (Sanity Check 2 in the table), which is due to the low per capita use of P.T. (on which the above values are based). For a similar reason (in the converse), the figures used for Ottawa are higher than those estimated from the other two sources. Furthermore, the theoretical utilization incidence are dependent on knowing total trip-making among the target, which, in this case, is an additional step away from known figures (total trips for all modes need to be estimated to determine new and diverted trips); also, estimating trips based purely on the number of accessible buses in the fleet is somewhat unrealistic -- it assumes linear dependence on fleet size, and assumes absolutely no dependence on target size.

Assume demand falls by 10% for a partially accessible system, a system with 25% of its fleet (and therefore 25% of the trips) lift-equipped. Adjusting demand to 1986 population figures, and allowing for one third less travel on weekends (Ref. 3), total annual one way trips for fully and partial accessibility are:

SUMMARY OF ANNUAL ONE WAY TRIPS (000s)

		FULLY ACCESSIBLE	PARTIALLY ACCESSIBLE
BELLEVILLE	- Low	0.6	0.6
	- High	1.2	1.1
	- Average	0.9	0.9
OTTAWA	- Low	52.9	47.6
	- High	100.2	90.1
	- Average	76.6	68.9
ONTARIO	- Low	426.2	383.6
	- High	807.4	726.7
	- Average	**616.8**	**555.2**

(13).6 MARKET NEED SERVED

This option would be especially helpful to the non-ambulatory whose primary difficulty is in boarding public transit. It will not serve any individual who is unable to get to the bus stop (and bus lift) or who does not have public transit available.

(13).7 TOTAL COSTS

Two options are assessed for each of the two transit properties and for Ontario: fully accessible, meaning 100% of the fleet is lift-equipped; and partially accessible, resulting in 25% of the fleet being lift-equipped. Demand for the partially accessible option is assumed to be 90% of the fully accessible system (does not assume a linear relationship with accessible fleet size).

As shall be demonstrated later, costs tend to be dependent on level of service provided (frequency and availability of service) rather than on demand. In fact, only two cost components are based on demand (one indirectly); they include the costs of purchasing and maintaining additional buses, and the costs associated with lift operation (both of these are slightly sensitive to service level in that demand varies slightly between the two levels of accessibility).

Any additional buses required to accommodate (or reserve space for) the target group is entered into the cost equation. Since service may deteriorate somewhat due to the additional time required to board the target population, some lost ridership is assumed; this is deducted from the total increased ridership to obtain net ridership. Tables (13).3 a) and (13).3 b) quantify the additional (or surplus) resources for both accessibility levels for Ottawa and Belleville, respectively. Assumptions used to quantify components of the calculations are included in the table as "notes". Based on these values, additional bus requirements for Ontario are estimated for the two accessibility levels. For a fully accessible system, it would appear that one additional bus per property would be adequate, except for Metro Toronto which would require three additional vehicles. From the two systems analyzed, one additional bus is required for every 77 accessible bus trips per day for a system that is partially accessible. Assuming on average 14 bus trips per active bus per day and 25% of trips accessible, then additional 184 buses are required for all of Ontario.

Total costs are calculated next for all six cases. Capital costs include the bus lifts, cost of purchasing any extra buses, and station/terminal and bus stop retrofit costs. Operating and maintenance costs are divided into lift operation (dependent on demand), lift maintenance (dependent on the number of lifts in operation), O&M of the additional buses and all of the stops and transit stations, training, and promotion and information dissemination. The results are presented in Tables (13).4 a) and b), in Tables (13).5 a) and b), and in Tables (13).6 a) and b), for Ottawa, Belleville, and Ontario respectively. Also included in the tables are the year(s) in which the expenditure is in effect. High and low costs are applied to cost components when appropriate; a "+" indicates the quantity is added to the existing cost for each year of the item. All cost figures are in 1986 dollars.

Net costs are calculated by subtracting fare revenue from total costs. Assuming an average trip fare for properties across Ontario of $1.00 (1986) for public transit, the percentage of revenue to total costs is about 2.3%. This will vary from property to property as cost per trip and fares charged vary. The breakdown of the calculation of net costs, annual budget (1986 and 1996), and provincial share (1986 and 1996) for the two options for Ontario is presented below:

COST ALLOCATION AND BUDGET CALCULATIONS FOR PUBLIC TRANSIT SYSTEMS

(ONTARIO TOTAL)

OPTION
(all figures in millions of $)

	FULLY ACCESS P.T.	PARTIALLY ACCESS P.T.
1) 30 Yr. Capital	140	85
2) 30 Yr. O&M	137	172
3) Total 30 Yr.	277	256
4) Net 30 Yr. (97.7% * 3)	271	250
5) Annual Budget (1986) (4 10.369)	26	24
6) Prov. Share (1986) ([75% * (1) + 25% * (2)] 10.369)	13	10
7) Annual Budget (1996)	42[1]	47[2]
8) Prov. Share (1996)	21[1]	20[2]

Notes:

1) Assumes 5% increase in costs/yr. (62.9% over 10), but no affect due to population growth because of surplus capacity in initial system.

2) Assume 5% increase in costs/yr. (62.9% over 10), and 20% increase in demand (due to target population growth) over the 10 year period.

Major capital expenditures are distributed over time, as indicated in Tables (13).7a and b, (13).8a and b, and (13).9a and b, and so total annual costs vary over time. Average annual costs and total costs over 30 years for the two options for Belleville, Ottawa and Ontario are as follows:

SUMMARY OF ANNUAL TOTAL COSTS (000s)

		FULLY ACCESSIBLE	PARTIALLY ACCESSIBLE
BELLEVILLE -	LOW	$92	$149
	HIGH	$192	$162
	AVERAGE	$142	$156
	NET AVERAGE	$139	$152
OTTAWA -	LOW	$2,150	$1,855
	HIGH	$3,048	$2,151
	AVERAGE	$2,600	$2,003
	NET AVERAGE	$2,540	$1,957
ONTARIO -	LOW	$23,945	$23,478
	HIGH	$29,385	$25,907
	AVERAGE	$26,700	$24,700
	NET AVERAGE	$26,000	$24,100

SUMMARY OF TOTAL 30 YEAR COSTS - PRESENT VALUE (000s)

		FULLY ACCESSIBLE	PARTIALLY ACCESSIBLE
BELLEVILLE -	LOW	$ 953	$ 1,550
	HIGH	$ 1,990	$ 1,680
	AVERAGE	$ 1,470	$ 1,620
	NET AVERAGE	$ 1,440	$ 1,580
OTTAWA -	LOW	$ 22,300	$ 19,200
	HIGH	$ 31,600	$ 22,300
	AVERAGE	$ 27,000	$ 20,800
	NET AVERAGE	$ 26,400	$ 20,300
ONTARIO -	LOW	$248,000	$243,000
	HIGH	$305,000	$269,000
	AVERAGE	$277,000	$256,000
	NET AVERAGE	$271,000	$250,000

(13).8 UNIT COSTS

From Tables (13).7 a and b, (13).8 a) and b), and (13).9 a) and b), total and unit 30 year costs are determined in present value (1986) terms. Demand is projected to 1986 figures in the unit cost calculation. Unit costs are summarized below:

SUMMARY OF UNIT COSTS

		FULLY ACCESSIBLE	PARTIALLY ACCESSIBLE
BELLEVILLE -	LOW	$77.17	$139.40
	HIGH	$304.24	$286.39
	BEST ESTIMATE	$157.80	$173.30
OTTAWA -	LOW	$21.47	$20.58
	HIGH	$57.66	$45.22
	BEST ESTIMATE	$33.90	$29.10
ONTARIO -	LOW	$29.66	$32.31
	HIGH	$68.95	$67.54
	BEST ESTIMATE	$43.30	$44.50

Belleville's unit costs are higher than Ottawa's in all scenarios, and Ontario falls in between, with the tendency towards the figures for Ottawa. Belleville's high unit costs are primarily due to the low demand. The reason for the relatively low unit cost in the low estimate for the fully accessible system (lower than for the partially accessible system) is that there is no need for an additional bus; in all of the other scenarios, at least one additional bus is required (see Tables (13).3 a) and b). In comparison, unit operating costs for the general public are $1.23 per passenger in Belleville, $1.10 per passenger in Ottawa, and $1.15 per passenger for all systems in Ontario. An estimate of total unit costs per passenger would likely be no more than twice this.

A best estimate of unit costs is made based on the net average of total costs divided by the average of total demand (arithmetic average between low and high). This figure is provided rather than the arithmetic mean of the low and high unit costs because the range of unit costs was based on mixing high and low total costs with high and low total demand (i.e., low unit cots = low total cost divided by high total demand). This mixing was performed because, in most instances, costs are independent of demand and the greatest range in unit costs would be achieved in this way.

TABLE (13).3 a): ADDITIONAL BUSES - OTTAWA

	LOW	HIGH
FULLY ACCESSIBLE		
a) **Additional Seat Requirements**		
Wheelchair demand (50%)	77	145
Regular seats/pass.	4	4
Proportion of Time extra seats needed[1]	0.3	0.3
Additional Seat Requirement	92.4	174
Non-wheelchair demand (50%)	77	145
Regular seats/pass.	1	1
Proportion of Time extra seats needed[1]	0.3	0.3
Additional Seat Requirement	23.1	43.5
TOTAL ADDITIONAL SEATS	116	218
b) **Lost Seats due to schedule delays**		
Delay (%)[2]	0.034	0.064
Seat loss/1% delay (%)[3]	0.3	0.6
TOTAL LOST SEATS	26	89
NET SEAT REQUIREMENT (a)-(b)[4]	27	192
ADDITIONAL BUSES[5] (5 bus trips/bus/day)	1	1

PARTIALLY ACCESSIBLE (25%)

a) **Bumped seat requirement** (to ensure seats are always available on each access bus)	
Accessible Bus Trips/day (25%)	1000
Accessible Bus Trips/peak[6] (at capacity)	518
NET SEAT REQUIREMENT (4/bus trip)	2072
ADDITIONAL BUSES[5] (3.25 bus trips/bus/peak)	13

TABLE (13).3 b): ADDITIONAL BUSES - BELLEVILLE

	LOW	HIGH
FULLY ACCESSIBLE		
a) **Additional Seat Requirements**		
Wheelchair demand (50%)	1	2
Regular seats/pass.	4	4
Proportion of Time extra seats needed[1]	0.3	0.3
Additional Seat Requirement	1.2	2.4
Non-wheelchair demand (50%)	1	2
Regular seats/pass.	1	1
Proportion of Time extra seats needed[1]	0.3	0.3
Additional Seat Requirement	0.3	0.6
TOTAL ADDITIONAL SEATS	1.5	3.0
b) **Lost Seats due to schedule delays**		
Delay (%)[2]	0.0003	0.0005
Seat loss/1% delay (%)[3]	0.3	0.6
TOTAL LOST SEATS	0.86	2.86
NET SEAT REQUIREMENT (a)-(b)[4]	-1.64	2.14
ADDITIONAL BUSES[5] (24.7 bus trips/bus/day)	0	1

PARTIALLY ACCESSIBLE (25%)	
a) **Bumped seat requirement** (to ensure seats are always available on each access bus)	
Accessible Bus Trips/day (25%)	77
Accessible Bus Trips/peak[6] (at capacity)	40
NET SEAT REQUIREMENT (4/bus trip)	160
ADDITIONAL BUSES[5] (8.24 bus trips/bus/peak)	1

NOTES TO TABLES (13).3 a) AND (13).3 b)

1. Bus is at capacity 90% of the time at peak; peak period is approximately 1/3 of operating day; assume travel pattern is equally distributed among target, that is 1/3 trips occur during peak; therefore 90% x 1/3 = 30%; assumes no capacity problem during off peak.

2. Delay (in %) is calculated as follows:

   (wheelchair trips/ bus trips) x
   (extra transfer time per wheelchair trips/ bus trip cycle time)

3. Ref. [24].

4. (b) is not related to (a); subtraction is made so that range is maximized.

5. Assumes bus capacity of 50 (seated); this is multiplied by bus trips/bus during period of concern to get capacity/bus; note buses often run standing room only, so this figure is conservative.

6. Assumes 58% of bus trips are made during peak period, and 90% of these are at capacity.

TABLE (13).4 a): COSTS - OTTAWA
(FULLY ACCESSIBLE)

			COST	
CAPITAL	YEAR(S)	QUANTITY	LOW	HIGH
Accessible Buses (800)	1-15 & 16-30	53.3/yr	@$25k/lift = $1,333k/yr	@$40k/lift = $2,132k/yr
Extra Buses (1)	1 & 16	1	$240k	$240k
Stations (14)	1-14	1/yr	@$50k/station = $50k/yr	@$75k/station = $75k/yr
Stops (5000)	1-15	333/yr	@$0.5k/stop = $167k/yr	@$0.7k/stop = $233k/yr

OPERATING AND MAINTENANCE (years 1-30)		LOW	HIGH
[1]Lift Operation	5.1 hrs - 9.7 hrs/day @ $13.20/hr	$24.6k/yr	$46.6k/yr
Lift Maintenance	$0.5k/lift/yr (years 1-15)	+$26.7k/yr	+$26.7k/yr
O&M of Add'n Buses (includes operator wage)	$117k/yr/bus	$117k/yr	$177k/yr
[2]Training (year 1) (years 2-30)		$300k/yr $100k/yr	$300k/yr $100k/yr
Promotion/Information		$1k/yr	$5k/yr
[3]Maintenance of Stations and Stops	(years 1-14) (year 15)	+ $17.65k/yr + $16.65k/yr	+ $17.65k/yr + $16.65k/yr

NOTES

1. Assumes 2 minutes/trip

2. 1 day/driver x 1289 @ $106/day = $136.6k
   3 days/mech x 266 @ $124/day = $ 99.0k
   $235.6k
   Trainers/material etc. 64.4k
   $300.0k/yr (first year)

3. Assumes snow removal currently exists at all stops
   stations - $1k/yr
   stop - $0.05k/yr

TABLE (13).4 b): COSTS - OTTAWA
(PARTIALLY ACCESSIBLE)

			COST	
CAPITAL	YEAR(S)	QUANTITY	LOW	HIGH
Accessible Buses (200)	1-15 & 16-30	13.3/yr	@$25k/lift = $333k/yr	@$40k/lift = $533k/yr
Extra Buses (13)	1-13 16-28	1/yr 1/yr	$240k/yr $240k/yr	$240k/yr $240k/yr
Stations (14)	1-14	1/yr	@$50k/station = $50k/yr	@$75k/station = $75k/yr
Stops (5000)	1-15	333/yr	@$0.5k/stop = $167k/yr	@$0.7k/stop = $233k/yr

OPERATING AND MAINTENANCE (years 1-30)		LOW	HIGH
[1]Lift Operation	4.6 hrs - 8.7 hrs/day @ $13.20/hr	$22.2k/yr	$41.9k/yr
Lift Maintenance	$0.5k/lift/yr (years 1-15)	+ $6.7k/yr	+ $6.7k/yr
O&M of Add'n Buses (includes operator wage)	$117k/yr/bus (years 1-13)	+ $117k/yr	+ $117k/yr
[2]Training (.25 of Fully Acc.)	(year 1) (years 2-30)	$75k/yr $25k/yr	$75k/yr $25k/yr
Promotion/Information		$1k/yr	$5k/yr
[3]Maintenance of Stations and Stops	(years 1-14) (year 15)	+ $17.65k/yr + $16.65k/yr	+ $17.65k/yr + $16.65k/yr

NOTES

1. Assumes 2 minutes/trip (demand = 90% of fully acc.)
2. See Full Accessible Option
3. Assumes snow removal currently exists at all stops
   stations - $1k/yr
   stop - $0.05k/yr

TABLE (13).5 a): COSTS - BELLEVILLE
(FULLY ACCESSIBLE)

			COST	
	YEAR(S)	QUANTITY	LOW	HIGH
CAPITAL				
Accessible Buses (15)	1-15 & 16-30	1/yr	@$25k/lift = $25k/yr	@$40k/lift = $40k/yr
Extra Buses (1)	1 & 16	1	$240k	$240k
Stations (0)	N/A	0	0 = $50k/yr	0 = $75k/yr
Stops (550)	1-15	36.7/yr	@$0.5k/stop = $18.3k/yr	@$0.7k/stop = $25.7k/yr

OPERATING AND MAINTENANCE (years 1-30)		LOW	HIGH
[1]Lift Operation	24.5 hrs - 46.2 hrs/yr @ $12.18/hr	$0.3k/yr	$0.56k/yr
Lift Maintenance	$0.5k/lift/yr (years 1-15)	+ $0.5k/yr	+ $0.5k/yr
O&M of Add'n Buses (includes operator wage)	$78k/yr/bus	0	$78k/yr
[2]Training (year 1)		$4k/yr	$4k/yr
(years 2-30)		$1k/yr	$1k/yr
Promotion/Information		$0.5k/yr	$1k/yr
[3]Maintenance of Stops	(years 1-15)	+ $1.84k/yr	+ $1.84k/yr

NOTES

1. Assumes 2 minutes/trip

2. 1 day/driver x 19 @ $97.44/day = $1.9k
3 days/mech x 3 @ $102.72/day = $0.9k
$2.8k
Trainers/material etc. $1.2k
$4.0k/yr (first year)

3. Assumes snow removal currently exists at all stops
total other costs = $0.05k/stop/yr

TABLE (13).5 b): COSTS - BELLEVILLE
(PARTIALLY ACCESSIBLE)

			COST	
CAPITAL	YEAR(S)	QUANTITY	LOW	HIGH
Accessible Buses (4)	1-14 & 16-19	1/yr	@$25k/lift = $25k/yr	@$40k/lift = $40k/yr
Extra Buses (1)	1-16	1/yr	$240k/yr	$240k/yr
Stations (0)	N/A	0	0	0
Stops (550)	1-15	36.7/yr	@$0.5k/stop = $18.3k/yr	@$0.7k/stop = $25.7k/yr

OPERATING AND MAINTENANCE (years 1-30)		LOW	HIGH
[1]Lift Operation	22 hrs - 41 hrs/yr @ $12.18/hr	$0.27k/yr	$0.5k/yr
Lift Maintenance	$0.5k/lift/yr (years 1-4)	+ $0.5k/yr	+ $0.5k/yr
O&M of Add'n Buses (includes operator wage)	$78k/yr/bus	+ $78k/yr	+ $78k/yr
[2]Training (.25 of Fully Acc.)	(year 1) (years 2-30)	$1k/yr $0.3k/yr	$1k/yr $0.3k/yr
Promotion/Information		$0.5k/yr	$1k/yr
[3]Maintenance of Stops	(years 1-15)	+ $1.84k/yr	+ $1.84k/yr

NOTES

1. Assumes 2 minutes/trip (demand = 90% of fully acc.)
2. See Full Accessible Option
3. Assumes snow removal currently exists at all stops
   total other costs = $0.05k/yr

TABLE (13).6 a): COSTS - ONTARIO
(FULLY ACCESSIBLE)

	YEAR(S)	QUANTITY	COST LOW	HIGH
CAPITAL				
Accessible Buses (4000)	1-15 & 16-30	267/yr	@$25k/lift = $6,667k/yr	@$40k/lift = $10,667k/yr
Extra Buses (61)	1 & 16	61	$14,640k	$14,640k
Stations (277)	1-15	19/yr	@$50k/station = $950k/yr	@$75k/station = $1425k/yr
Stops (64000)	1-15	4267/yr	@$0.5k/stop = $2133k/yr	@$0.7k/stop = $2987k/yr
OPERATING AND MAINTENANCE (years 1-30)			LOW	HIGH
[1]Lift Operation	41.1 hrs - 77.8 hrs/day @ $11.72/hr		$175.8k/yr	$332.8k/yr
Lift Maintenance	$0.5k/lift/yr (years 1-15)		+$133k/yr	+$133k/yr
O&M of Add'n Buses (includes operator wage)	$145k/yr/bus		$8845k/yr	$8845k/yr
[2]Training (year 1)			$2,700k/yr	$2,700k/yr
(years 2-30)			$900k/yr	$900k/yr
Promotion/Information			$40k/yr	$250k/yr
[3]Maintenance of Stations and Stops	(years 1-15)		+ $232k/yr	+ $232k/yr

NOTES

1. Assumes 2 minutes/trip

2. 1 day/driver x 8613 @ $94/day = $ 810k
   3 days/mech x 4348 @ $110/day = $1,435k
   $2,245k
   Trainers/material etc. 455k
   $2,700k/yr (first year)

3. Assumes snow removal currently exists at all stops
   stations - $1k/yr
   stop - $0.05k/yr

TABLE (13).6 b): COSTS - ONTARIO
(PARTIALLY ACCESSIBLE)

CAPITAL	YEAR(S)	QUANTITY	COST	
			LOW	HIGH
Accessible Buses (1000)	1-15 & 16-30	67/yr	@$25k/lift = $1,675k/yr	@$40k/lift = $2,680k/yr
Extra Buses (184)	1-15 16-30	12/yr	$2,880k	$2,880k
Stations (277)	1-15	19/yr	@$50k/station = $950k/yr	@$75k/station = $1425k/yr
Stops (64000)	1-15	4267/yr	@$0.5k/stop = $2133k/yr	@$0.7k/stop = $2987k/yr

OPERATING AND MAINTENANCE (years 1-30)		LOW	HIGH
[1]Lift Operation	37 hrs - 70 hrs/day @ $11.72/hr	$158.2k/yr	$299.5k/yr
Lift Maintenance	$0.5k/lift/yr (years 1-15)	+$33.3k/yr	+$33.3k/yr
O&M of Add'n Buses (includes operator wage)	$145k/yr/bus (years 1-15)	$1740k/yr	$1740k/yr
[2]Training (.25 of Fully Acc.)	(year 1) (years 2-30)	$675k/yr $225k/yr	$675k/yr $225k/yr
Promotion/Information		$40k/yr	$250k/yr
[3]Maintenance of Stations and Stops	(years 1-15)	+ $232k/yr	+ $232k/yr

NOTES

1. Assumes 2 minutes/trip (demand = 90% of fully acc.)
2. See Full Accessible Option
3. Assumes snow removal currently exists at all stops
   stations - $1k/yr
   stop - $0.05k/yr

TABLE 13.7a: NET PRESENT VALUE OF TOTAL COSTS BELLEVILLE - FULLY ACCESSIBLE

YEAR	CAPITAL COSTS (000s)		OPERATING & MAINTENANCE (000s)		TOTAL (000s)	
	LOW	HIGH	LOW	HIGH	LOW	HIGH
1	283	306	7	86	290	392
2	43	66	9	88	53	154
3	43	66	12	91	55	156
4	43	66	14	93	57	159
5	43	66	17	95	60	161
6	43	66	19	98	62	163
7	43	66	21	100	64	166
8	43	66	24	102	67	168
9	43	66	26	105	69	170
10	43	66	28	107	72	173
11	43	66	31	109	74	175
12	43	66	33	112	76	177
13	43	66	35	114	79	180
14	43	66	38	116	81	182
15	43	66	40	119	83	184
16	265	280	40	119	305	399
17	25	40	40	119	65	159
18	25	40	40	119	65	159
19	25	40	40	119	65	159
20	25	40	40	119	65	159
21	25	40	40	119	65	159
22	25	40	40	119	65	159
23	25	40	40	119	65	159
24	25	40	40	119	65	159
25	25	40	40	119	65	159
26	25	40	40	119	65	159
27	25	40	40	119	65	159
28	25	40	40	119	65	159
29	25	40	40	119	65	159
30	25	40	40	119	65	159
NPV	710	927	243	1060	953	1987

ESTIMATED ANNUAL DEMAND (000s)	0.63	1.19
ESTIMATED ANNUAL COST (000s)	91.88	191.62
NPV OF DEMAND OVER 30 YEARS (000s)	6.5	12.3
COST/TRIP (NPV OF TOTAL COST/NPV OF DEMAND)	77.17	304.24

TABLE 13.7b: NET PRESENT VALUE OF TOTAL COSTS BELLEVILLE - PARTIALLY ACCESSIBLE

YEAR	CAPITAL COSTS (000s)		OPERATING & MAINTENANCE (000s)		TOTAL (000s)	
	LOW	HIGH	LOW	HIGH	LOW	HIGH
1	283	306	82	83	365	389
2	43	66	84	84	127	150
3	43	66	86	87	129	153
4	43	66	88	89	132	155
5	18	26	90	91	109	117
6	18	26	92	93	110	119
7	18	26	94	95	112	120
8	18	26	96	97	114	122
9	18	26	98	98	116	124
10	18	26	99	100	118	126
11	18	26	101	102	120	128
12	18	26	103	104	121	130
13	18	26	105	106	123	131
14	18	26	107	108	125	133
15	18	26	109	109	127	135
16	265	280	109	109	374	389
17	25	40	109	109	134	149
18	25	40	109	109	134	149
19	25	40	109	109	134	149
20			109	109	109	109
21			109	109	109	109
22			109	109	109	109
23			109	109	109	109
24			109	109	109	109
25			109	109	109	109
26			109	109	109	109
27			109	109	109	109
28			109	109	109	109
29			109	109	109	109
30			109	109	109	109
NPV	559	685	990	998	1549	1683

ESTIMATED ANNUAL DEMAND (000s)	0.57	1.07
ESTIMATED ANNUAL COST (000s)	149.39	162.34
NPV OF DEMAND OVER 30 YEARS (000s)	5.9	11.1
COST/TRIP (NPV OF TOTAL COST/NPV OF DEMAND)	139.40	286.39

TABLE 13.8a: NET PRESENT VALUE OF TOTAL COSTS
OTTAWA - FULLY ACCESSIBLE

YEAR	CAPITAL COSTS (000s)		OPERATING & MAINTENANCE (000s)		TOTAL (000s)	
	LOW	HIGH	LOW	HIGH	LOW	HIGH
1	1790	2680	487	513	2277	3193
2	1550	2440	331	357	1881	2797
3	1550	2440	376	402	1926	2842
4	1550	2440	420	446	1970	2886
5	1550	2440	464	490	2014	2930
6	1550	2440	509	535	2059	2975
7	1550	2440	553	579	2103	3019
8	1550	2440	597	623	2147	3063
9	1550	2440	642	668	2192	3108
10	1550	2440	686	712	2236	3152
11	1550	2440	730	756	2280	3196
12	1550	2440	775	801	2325	3241
13	1550	2440	819	845	2369	3285
14	1550	2440	864	890	2414	3330
15	1500	2365	907	933	2407	3298
16	1573	2372	907	933	2480	3305
17	1333	2132	907	933	2240	3065
18	1333	2132	907	933	2240	3065
19	1333	2132	907	933	2240	3065
20	1333	2132	907	933	2240	3065
21	1333	2132	907	933	2240	3065
22	1333	2132	907	933	2240	3065
23	1333	2132	907	933	2240	3065
24	1333	2132	907	933	2240	3065
25	1333	2132	907	933	2240	3065
26	1333	2132	907	933	2240	3065
27	1333	2132	907	933	2240	3065
28	1333	2132	907	933	2240	3065
29	1333	2132	907	933	2240	3065
30	1333	2132	907	933	2240	3065
NPV	15923	24963	6376	6645	22298	31608

ESTIMATED ANNUAL DEMAND (000s)	52.86	100.16
ESTIMATED ANNUAL COST (000s)	2150.35	3048.14
NPV OF DEMAND OVER 30 YEARS (000s)	548.2	1038.6
COST/TRIP (NPV OF TOTAL COST/NPV OF DEMAND)	21.47	57.66

TABLE 13.8b: NET PRESENT VALUE OF TOTAL COSTS
OTTAWA - PARTIALLY ACCESSIBLE

YEAR	CAPITAL COSTS (000s)		OPERATING & MAINTENANCE (000s)		TOTAL (000s)	
	LOW	HIGH	LOW	HIGH	LOW	HIGH
1	790	1081	240	263	1030	1344
2	790	1081	331	355	1121	1436
3	790	1081	472	496	1262	1577
4	790	1081	614	637	1404	1718
5	790	1081	755	779	1545	1860
6	790	1081	896	920	1686	2001
7	790	1081	1038	1061	1828	2142
8	790	1081	1179	1203	1969	2284
9	790	1081	1320	1344	2110	2425
10	790	1081	1462	1485	2252	2566
11	790	1081	1603	1627	2393	2708
12	790	1081	1744	1768	2534	2849
13	790	1081	1886	1909	2676	2990
14	550	841	1910	1934	2460	2775
15	500	766	1933	1957	2433	2723
16	573	773	1933	1957	2506	2730
17	573	773	1933	1957	2506	2730
18	573	773	1933	1957	2506	2730
19	573	773	1933	1957	2506	2730
20	573	773	1933	1957	2506	2730
21	573	773	1933	1957	2506	2730
22	573	773	1933	1957	2506	2730
23	573	773	1933	1957	2506	2730
24	573	773	1933	1957	2506	2730
25	573	773	1933	1957	2506	2730
26	573	773	1933	1957	2506	2730
27	573	773	1933	1957	2506	2730
28	573	773	1933	1957	2506	2730
29	333	533	1933	1957	2266	2490
30	333	533	1933	1957	2266	2490
NPV	7580	10408	11656	11901	19235	22310

ESTIMATED ANNUAL DEMAND (000s)	47.58	90.14
ESTIMATED ANNUAL COST (000s)	1854.98	2151.47
NPV OF DEMAND OVER 30 YEARS (000s)	493.3	934.7
COST/TRIP (NPV OF TOTAL COST/NPV OF DEMAND)	20.58	45.22

TABLE 13.9a: NET PRESENT VALUE OF TOTAL COSTS ONTARIO - FULLY ACCESSIBLE

YEAR	CAPITAL COSTS (000s)		OPERATING & MAINTENANCE (000s)		TOTAL (000s)	
	LOW	HIGH	LOW	HIGH	LOW	HIGH
1	24390	29719	12126	12493	36516	42212
2	9750	15079	10691	11058	20441	26137
3	9750	15079	11056	11423	20806	26502
4	9750	15079	11421	11788	21171	26867
5	9750	15079	11786	12153	21536	27232
6	9750	15079	12151	12518	21901	27597
7	9750	15079	12516	12883	22266	27962
8	9750	15079	12881	13248	22631	28327
9	9750	15079	13246	13613	22996	28692
10	9750	15079	13611	13978	23361	29057
11	9750	15079	13976	14343	23726	29422
12	9750	15079	14341	14708	24091	29787
13	9750	15079	14706	15073	24456	30152
14	9750	15079	15071	15438	24821	30517
15	9750	15079	15436	15803	25186	30882
16	21307	25307	15436	15803	36743	41110
17	6667	10667	15436	15803	22103	26470
18	6667	10667	15436	15803	22103	26470
19	6667	10667	15436	15803	22103	26470
20	6667	10667	15436	15803	22103	26470
21	6667	10667	15436	15803	22103	26470
22	6667	10667	15436	15803	22103	26470
23	6667	10667	15436	15803	22103	26470
24	6667	10667	15436	15803	22103	26470
25	6667	10667	15436	15803	22103	26470
26	6667	10667	15436	15803	22103	26470
27	6667	10667	15436	15803	22103	26470
28	6667	10667	15436	15803	22103	26470
29	6667	10667	15436	15803	22103	26470
30	6667	10667	15436	15803	22103	26470
NPV	113073	165671	135230	139036	248304	304707

ESTIMATED ANNUAL DEMAND (000s)	426.17	807.42
ESTIMATED ANNUAL COST (000s)	23945.36	29384.66
NPV OF DEMAND OVER 30 YEARS (000s)	4419.3	8372.6
COST/TRIP (NPV OF TOTAL COST/NPV OF DEMAND)	29.66	68.95

TABLE 13.9b: NET PRESENT VALUE OF TOTAL COSTS ONTARIO - PARTIALLY ACCESSIBLE

YEAR	CAPITAL COSTS (000s)		OPERATING & MAINTENANCE (000s)		TOTAL (000s)	
	LOW	HIGH	LOW	HIGH	LOW	HIGH
1	7638	9972	2879	3230	10517	13202
2	7638	9972	4434	4785	12072	14757
3	7638	9972	6439	6790	14077	16762
4	7638	9972	8444	8796	16082	18768
5	7638	9972	10450	10801	18088	20773
6	7638	9972	12455	12806	20093	22778
7	7638	9972	14460	14812	22098	24784
8	7638	9972	16466	16817	24104	26789
9	7638	9972	18471	18822	26109	28794
10	7638	9972	20476	20828	28114	30800
11	7638	9972	22482	22833	30120	32805
12	7638	9972	24487	24838	32125	34810
13	7638	9972	26492	26843	34130	36815
14	7638	9972	28497	28849	36135	38821
15	7638	9972	30503	30854	38141	40826
16	4555	5560	30503	30854	35058	36414
17	4555	5560	30503	30854	35058	36414
18	4555	5560	30503	30854	35058	36414
19	4555	5560	30503	30854	35058	36414
20	4555	5560	30503	30854	35058	36414
21	4555	5560	30503	30854	35058	36414
22	4555	5560	30503	30854	35058	36414
23	4555	5560	30503	30854	35058	36414
24	4555	5560	30503	30854	35058	36414
25	4555	5560	30503	30854	35058	36414
26	4555	5560	30503	30854	35058	36414
27	4555	5560	30503	30854	35058	36414
28	4555	5560	30503	30854	35058	36414
29	4555	5560	30503	30854	35058	36414
30	4555	5560	30503	30854	35058	36414
NPV	73028	94569	170431	174074	243459	268643

ESTIMATED ANNUAL DEMAND (000s)	383.56	726.67
ESTIMATED ANNUAL COST (000s)	23478.19	25906.79
NPV OF DEMAND OVER 30 YEARS (000s)	3977.3	7535.3
COST/TRIP (NPV OF TOTAL COST/NPV OF DEMAND)	32.31	67.54

(13).9 QUALITY OF SERVICE

The quality of service must be considered less than for special transit, automobile and taxi. Many new users of the system, because of their mobility condition, would have additional difficulties not encountered in the other modes.

(13).10 LEVEL OF SERVICE

The level of service when compared to special transit is poorer in that it is not door-to-door. The lack of door-to-door service can cause problems for those who have difficulty getting to a bus stop (and lift) for a various number of reasons, especially weather-related problems that are beyond our control. However, public transit allows for spontaneous and scheduled trip-making (limited for the partially accessible system where only specially marked trips are accessible) for trip purposes that cannot or prefer not to be planned, thereby increasing the systems utility to the target. The availability of public transit generally is good, and is offered, in many instances, where special transit is not. The cost to the user is in many cases less than that for special transit.

(13).11 DEVELOPMENT RISK

Depending on the level of "accessibility" that is decided by the property, risk can vary from moderate to high. Accessible systems in the U.S. have had a broad range of success. A great deal is dependent on implementation, on promotion, on the alternatives available to the disabled, and on the costs, both to the user and to the system. A partially accessible system can be the first step of a phased-in approach to a fully accessible system; capital costs are less, while level of service is still reasonably good, and most importantly, it allows the market for such a service to be tested.

Operational risk is considered to be minimal, given the relatively low level of demand, and the quick loading cycle time (one minute per lift user). However, there is always the risk of lift failure, which in some cases can immobilize the vehicle.

(13).12 COMPATIBILITY WITH OPERATORS MANDATE

This program is totally compatible with the mandate of municipal transit operators.

(13).13 SYSTEM COMPATIBILITY

Accessible fixed-route public transit concerns the modification of an existing system which in many instance already has some features to assist the disabled. An accessible transit system is not expected to generate compatibility problems if it is designed and implemented properly. Minor schedule and route modifications may be required, especially to the larger systems. Because of the low demands, affects to other programs are expected to be minimal.

(13).14 SAFETY CONSIDERATIONS

Safety is a concern for any system, and it is especially so for this system. Proper training is a must for the operators of the lift (bus drivers) to ensure proper loading and transfer of the passenger. The design and installation of the lift is also important to safety. Adherence to schedules is important, but not so much as to cut corners when dealing with passengers (disabled or not).

(13).15 PUBLIC ACCEPTABILITY

Delays to the system will undoubtedly occur. It is this inconvenience to the general ridership that may cause problems int heir acceptance of an acceptable system. Those with impatience will no longer use the system; those who do, may have a positive perception of public transit because of its initiative.

(13).16 HUMAN RIGHTS IMPLICATIONS

One of the pros of this system is the integration of the target group into the mainstream. The degree of integration is dependent on the level of accessibility, but in any case, is in line with Human Rights issues.

(13).17 SUMMARY

The pros of the initiative are:

- integration of the target into the mainstream;
- other travellers can benefit;
- spontaneous trip-making is possible; and,
- the technology is commercially available.

The cons of the system are:

- it can be operationally impractical under certain conditions (eg. winter and poor weather conditions, ditches and road/stop layout etc.);
- it does not help those who are unable to get to the bus stop;
- poor LOS, especially for the partially accessible system; and
- extra maintenance required, and an increased likelihood of bus failure due to lift failure.

OPTION (14): ACCESSIBLE TORONTO SUBWAY

(14).1 SECTOR:

- Urban.

(14).2 TARGET GROUP:

- Those unable to use public transit, and those who live in Metro Toronto.

(14).3 DESCRIPTION

Previous research into the subject of making existing subway systems fully accessible to disabled persons concludes that about 90 percent of the potential demand can be accommodated by making just key stations on the system accessible. In studies of nine U.S. subway systems conducted by the U.S. Department of Transportation key stations were found to number between 40 percent and 60 percent of all stations in a system. For the purposes here, it is assumed that about half the Toronto Transit Commission's stations -- 32 stations in all -- are key and in need of modification under a policy of full accessibility. Stations would be equipped with the minimum number of elevators needed to achieve full access to all platforms and all other features.

(14).4 RELEVANT CURRENT INITIATIVES

- Capital Retrofit Subsidies (E.1.3);
- Safety Inspection Program (E.1.2);
- PST Exemptions - Equipment (E.1.4);
- Terminal Upgrades (E.2.6);
- Public Transit Fare Reduction (E.3.3);
- Equipment Upgrades in Public Transit (E.3.4);
- Vancouver's Advanced LRT System (G.7);
- North American Accessible Public Transit System (G.10).

(14).5 TOTAL MARKET SERVED

The catchment area served by the TTC subway system is about 60% of Metropolitan Toronto (This includes the rapid transit system in Scarborough). Total population in this area is approximately 1.3 million (1983). The target for this option includes those in Group A who are unable to board regular public transportation. This represents about 0.52% of the general population or 6,800 people (1983), of which about half will be using a wheelchair or walker.

(14).6 MARKET NEED SERVED

Evidence drawn from the use of accessible subway systems in the United States indicates very low demand overall. In Washington D.C. surveys have recorded as few as seven trips per day despite the accessibility over 60 stations. Evidence from other systems suggests similarly low demand (on average, about 0.2 trips per accessible station per day). This translates to about 6.4 accessible boardings per average day for the TTC subway system, or about 2,300 trips per year (1986). This assumes that half of the stations are key stations and are made accessible.

Although there is a great deal of uncertainty over prospective demand, the evidence accumulated over the last ten years indicates that fixed-route accessible service competes for disabled passengers very poorly when pitted against door-to-door modes such as specialized service. Unless the Wheel-Trans service were to be withdrawn, therefore, subway demand would almost certainly be very low.

If, on the other hand, Wheel-Trans were to become a feeder service to subway stations, demand would be higher. Under this approach however, the cost of the feeder service would have to be added to the cost of subway accessibility in the assessment of economy and effectiveness. It must also be recognized that in reconfiguring Wheel-Trans as a feeder service, those requiring door-to-door service would no longer be served. A large body of research indicates that for many, the subway-feeder combination would not represent an adequate substitute.

(14).7 TOTAL COSTS

Although a full analysis of subway accessibility is beyond the scope of this study, a preliminary cost forecast can be developed based upon previous research. Based on studies conducted in the United States,[39] the average cost in 1986 dollars to make a key station accessible is about $3.4 million [$2M(US)1979]. The TTC study estimates cost per station, for their cheapest station retrofits, to be about $2M (1985) or $2.1M (1986). However, this does not include purchases fo additional property that may be required for elevators. Additional operating and maintenance costs are estimated in these studies to amount to about $316,000 per station annually. In addition, the Toronto Transit Commission has estimated the need for rolling stock adaptations amounting to about $71 million with associated operating and maintenance costs of about $1.4 million a year. In total, the capital costs of making 32 key subway stations accessible is estimated at $180 million with recurring annual operating and maintenance expenses of $11.5 million.

If it is assumed that key stations will be modified over a phase-in period of ten years and that the equipment has a 30 year life, the present value of these expenditures amounts to $200 million, not including feeder costs (revenue from fares is minimal).

---

[39] See, United States Department of Transportation, Section 321 (a) Study, 1981 and Congressional Budget Office, Urban Transportation for handicapped Persons: Alternative Federal Approaches, 1979.

The table below identifies total costs and budgetary outlays for 1986 and 1996 of $200 million, $19 million and $31 million, respectively. The provincial share is calculated in the same way as conventional P.T.

COST ALLOCATION & BUDGET CALCULATIONS FOR PUBLIC TRANSIT SYSTEMS

TTC
SUBWAY

(all figures in millions of $)

1) 30 Yr. Capital	81
2) 30 Yr. O&M	119
3) Total 30 Yr.	200
4) Net 30 Yr. (99.9% * (3))	200
5) Annual Budget (1986) ((4) / 10.369)	19
6) MTC share (1986) ([75% * (1) + 25% * (2)] / 10.369)	9
7) Annual Budget (1996)	31[1]
8) Prov. Share (1996)	15[1]

NOTES: 1) Assumes 5% increase in costs/yr. (62.9% over 10), but no affect due to population growth because of surplus capacity in initial system.

(14).8 UNIT COSTS

Even under the most optimistic forecasts of demand, an accessible subway system would cost over $800 per trip. Based on evidence drawn from other systems, the cost to the TTC system would be approximately $8,200 per trip (based on 0.2 boardings per accessible station).

(14).9 QUALITY OF SERVICE

The quality of service must be considered less than for special transit, automobile and taxi. Many new users of the system, because of their mobility condition, would have additional difficulties not encountered in the other modes.

(14).10 LEVEL OF SERVICE

The level of service when compared to special transit is poorer in that it is not door-to-door. The lack of door-to-door service can cause problems for those who have difficulty getting to a bus stop (and lift) for a various number of reasons, especially weather-related problems that are beyond our control. However, public transit allows for spontaneous and scheduled trip-making (limited for the partially accessible system where only specially marked trips are accessible) for trip purposes that cannot or prefer not to be planned, thereby increasing the systems utility to the target. The availability of public transit generally is good, and is offered, in many instances, where special transit is not. The cost to the user is in many cases less than that for special transit.

(14).11 DEVELOPMENT RISK

Depending on the level of "accessibility" that is decided by the property, risk can vary from moderate to high. Accessible systems in the U.S. have had a broad range of success. A great deal is dependent on implementation, on promotion, on the alternatives available to the disabled, and on the costs, both to the user and to the system. A partially accessible system can be the first step of a phased-in approach to a fully accessible system; capital costs are less, while level of service is still reasonably good, and most importantly, it allows the market for such a service to be tested.

Operational risk is considered to be minimal, given the relatively low level of demand, and the quick loading cycle time (one minute per lift user). However, there is always the risk of lift failure, which in some cases can immobilize the vehicle.

(14).12 COMPATIBILITY WITH OPERATORS MANDATE

This program is totally compatible with the mandate of municipal transit operators.

(14).13 SYSTEM COMPATIBILITY

Accessible fixed-route public transit concerns the modification of an existing system which in many instance already has some features to assist the disabled. An accessible transit system is not expected to generate compatibility problems if it is designed and implemented properly. Minor schedule and route modifications may be required, especially to the larger systems. Because of the low demands, affects to other programs are expected to be minimal.

(14).14 SAFETY CONSIDERATIONS

Safety is a concern for any system, and it is especially so for this system. Proper training is a must for the operators of the lift (bus drivers) to ensure proper loading and transfer of the passenger. The design and installation of the lift is also important to safety. Adherence to schedules is important, but not so much as to cut corners when dealing with passengers (disabled or not).

(14).15 PUBLIC ACCEPTABILITY

Delays to the system will undoubtedly occur. It is this inconvenience to the general ridership that may cause problems in their acceptance of an acceptable system. Those with impatience will no longer use the system; those who do, may have a positive perception of public transit because of its initiative.

(14).16 HUMAN RIGHTS IMPLICATIONS

One of the pros of this system is the integration of the target group into the mainstream. The degree of integration is dependent on the level of accessibility, but in any case, is in line with Human Rights issues.

(14).17 SUMMARY

The pros of the initiative are:

- integration of the target into the mainstream;
- other travellers can benefit;
- spontaneous trip-making is possible; and
- the technology is commercially available.

The cons of the system are:

- it can be operationally impractical under certain conditions (eg. winter and poor weather conditions, ditches and road/stop layout etc.);
- it does not help those who are unable to get to the bus stop;
- poor LOS, especially for the partially accessible system; and
- extra maintenance required, and an increased likelihood of bus failure due to lift failure.

RURAL AREA OPTIONS

OPTION (15): EXTEND SPECIALIZED TRANSIT TO RURAL AREAS

(15).1 SECTOR:

- Rural

(15).2 TARGET GROUP:

- Those unable to use public transportation.

(15).3 DESCRIPTION

Disabled persons who reside in rural areas have few transportation alternatives. Although cars are used by many, they are expensive. Taxis are available to 64% of the rural disabled, but they are also expensive. The average rural disabled person is in an income bracket lower than most. Thus, there are individuals who cannot use these modes of transport, for financial and/or physical reasons.

One solution for these individuals is the provision of specialized transit services in rural areas. Theoretically speaking, such an initiative seems simple and obvious. In practice, it is not. MTC, in its policy for the specialized transit recognized the rural problem years ago. Initially the policy restricted subsidies to those communities with a public transit system; MTC subsequently eliminated that criterion, and now offers subsidies to any recognized municipality.

It seems that further incentive is required. Such incentives could be in the form of:

- Revisions to the specialized transit policies regarding capital subsidies;
- Aggressive "marketing" of the provincially-sponsored program to rural municipalities;
- Subsidized taxi service, as conceived in the urban Option (7);
- The subsidy of accessible taxi purchases, Option (16); or
- Block grants to rural municipalities, Option (17).

Whatever the implementation mechanism, this option assumes that some form of specialized transit is extended to most rural areas, ultimately serving 95% of Ontario's total population (including urban systems, which currently cover 75% of the province).

(15).5 TOTAL MARKET

The table below shows that 20,600 persons would benefit from specialized transit in rural areas.

TABLE (15).2: PROJECTED MAKE-UP OF 1986 SPECIALIZED TRANSIT REGISTRANTS

If Eligibility Expanded (to "Unable to Use") and similar number of operators allow relaxed eligibility.		
Total Eligible in Ontario (1986) (i.e. Those Unable to Use P.T.)[31]		90,300
Percentage of Ontario covered (Rural Areas)[34]	*	20%
Total Eligible in current service area	=	18,100
Minus percentage who do not register[32]	-	10%
Number of eligible who register	=	16,300
Plus 21%[33][34] "extras" (mentally impaired, blind, elderly)	+	4,300
Total registrants under revised eligibility	=	20,600

(15).6 MARKET NEED SERVED

Specialized transit users travel at a rate of 31.5 trips/year, resulting in a total of 649,000 trips/year for this option.

(15).7 UNIT COSTS

It is assumed that the new rural service will use taxis, or smaller vehicles with non-unionized drivers. Thus, unit costs will be comparable to urban taxi costs, but slightly higher due to longer trip lengths. The urban case is $7/trips; and $8/trip is used here $7.30/trip if the fare is not included.)

---

[31] 1.21% of the total population, as derived in Section 4.1 of the Main Report.

[32] Estimated value; specialized transit operators content that "almost all" who are eligible will register.

[33] From Table (6).1

[34] 25% of Ontario was not covered by specialized transit in 1986, but it is unlikely that the expanded service will reach all remote areas; thus 20% of the population is assumed covered

(15).8 TOTAL COSTS

649,000 trips, at $8/trip gives $5.19M/year. (The cost excluding fares is $4.8M). 50% of this, or $2.6M/year is assumed by MTC.

In 1996, if inflation and population are accounted for, the costs are $9.4M per year, with $5.4M per year assumed by MTC. Over 30 years, the total present valued costs are $50M.

(15).9 -- (15).17 OTHER FACTORS

Similar to Options (6) and (17).

OPTION (16): ACCESSIBLE VEHICLES SUBSIDIES

(16).1 SECTOR:

- Rural

(16).2 TARGET GROUP:

- Those unable to board public transportation, who are also non-ambulatory.

(16).3 DESCRIPTION

This option is similar, in motivation and content, to that proposed for the urban area (Option (8)); a 50% subsidy of the initial cost of an accessible vehicle. The subsidy could be used by the estimated 140 taxi companies in rural municipalities, or possibly by other groups for the provision of accessible service.

The taxi vehicles could be similar to Vancouver's Checker Cabs, with ramps and raised roofs (see Option (8)). Non-taxi alternatives include multi-purpose vehicles, such as those being demonstrated in Manitoba. (See Appendix G.1.) Such vehicles are designed as ambulances and specialized transit vans. The concept is that few ambulance calls are made in small communities, and an ambulance can therefore serve a second function. (Other combinations are feasible: school buses, delivery vans, etc.)

(16).4 RELEVANT CURRENT INITIATIVES

Relevant current initiatives:

- Paratransit Service (E.1.1);
- Taxi Regulation (E.3.2);
- Vehicle Acquisition Assistance and Tax Rebates (E.2.1, E.2.2);
- Experience in Calgary, Quebec City, Danville, Vancouver, Hamilton, London (U.K.) (G.2, G.3, G.5, G.6, G.14, G.15).

(16).5 TOTAL MARKET

Of the 20,600 rural persons potential registered in specialized transit (from Option (15)), 16,300 are (strictly speaking) unable to use public transportation. Thirty-five percent of these are non-ambulatory (see Option (8)). Furthermore, taxi services will penetrate 25% of the market. Thus, this initiative will serve 1,400 persons.

(16).6 MARKET NEED SERVED

At 31.5 trips/year, this option will provide 44,100 trips/year.

(16).7 COSTS

There are 188 municipalities in Ontario with taxi companies. Fifty-five of these are "urban" areas, already served by specialized transit. This option would apply to the remaining 133 municipalities plus some new ones. Total costs are calculated to be $333,000/year, based on the following assumptions:

- 160 taxis subsidized;
- An initial cost of $25,000 per accessible cab, subsidized by MTC for 50%; and,
- a six year life per cab.

If the option were to be continued into 1996, the cost would be approximately $600,000/year, and the total 30 year cost would be $3M (in 1986 dollars).

Note that after six years, this option could be reduced in magnitude. (The market would take care of itself.)

(16).8 UNIT COSTS

Based on 44,100 trips/year (from Section (16).6) the unit costs of this option is $7.50/trip.

(16).9 -- (16).17 OTHER ITEMS

Similar to Options (6) and (8).

OPTION (17): MUNICIPAL BLOCK GRANTS

(17).1 SECTOR:

- Rural

(17).2 TARGET GROUP:

- As determined by the municipality, but loosely based on those unable to use public transportation.

(17).3 DESCRIPTION

Currently, the province does little in the way of specialized transportation service or subsidies to most rural municipalities. However, many municipalities have a network of volunteer drivers, volunteer transit services and/or agency services. Furthermore, approximately 140 rural municipalities are served by taxis. Clearly, the needs of each of the estimated 620 rural municipalities in Ontario are different, and a provincial policy administered broadly across all municipalities may favour some municipalities over others.

This option provides for block grants from the province to small municipalities, for use in special transportation as the municipality sees fit. This enables local authorities, transportation planners and/or user groups to channel money in directions which they perceive to be most important; taxis, specialized hybrid vehicles (such as ambulances with lifts), volunteer groups, individuals, etc. Figure 5.1 illustrates the concept.

This grant could be based on the number of disabled persons in the jurisdiction, or a more complex formula attempting to quantify specialized transit needs. The municipality possibly with the help of a local group (consisting of transportation planners, users, etc.) could develop a local transport plan (LTP). This plan would be submitted to the province for approval. Through audit, MTC can ensure that their money is properly spent, i.e. that the municipal program meets minimum service criteria.

Although many transit planners are extremely knowledgeable in the field of special transportation, one risk with this option is that some are not. To utilize the grant most effectively, decision-makers within the municipality will have to assess their current market and services. Furthermore, they should familiarize themselves with alternatives and experiences elsewhere. MTC should assist in such assessments by providing technical support.

The merit behind giving municipalities grants to provide transportation services for the disabled community, is it enables transportation decision-makers within the municipality to channel money into developing services, which they perceive to be important, and are not currently provided. The logic behind decentralizing the current subsidy system, is simply that the needs of each municipality or region are different, and provincial policy administered broadly across all municipalities favours some municipalities over others. Furthermore, municipal transportation planners are aware of the unique transportation challenges pertaining to disabled travel existing in their municipality, and thus can use the grant to directly bridge gaps in service, eligibility, etc. that are specific to the municipality.

The implementation of this municipal grant system would involve the following issues:

1. **The establishment of transportation regions**: This option has assumed that transportation regions receiving municipal grants correspond to existing municipality boundaries. Some consideration should be given to extending the transportation regions receiving funding beyond municipal boundaries to facilitate inter-municipal and inter-regional trips. Fundamental to this option is whether to offer municipal grants to all municipalities in Ontario or just to areas with no paratransit service available. If municipal grants are extended to all of Ontario, it has been assumed that paratransit subsidies would be replaced by a municipal grant. On the other hand if the municipal grant is extended to only areas without paratransit service it has been assumed that the current paratransit subsidy mechanism through MTC will continue to exist. Both options have been addressed in the demand and costing which follow.

2. **Eligibility**: The municipality receiving a municipal grant will determine the eligibility definition for each service provided, i.e. the onus would be on the municipality to package all eligibility definitions relating to disabled transportation services, in such a way that the needs of the target group are met.

3. **Service criteria**: To ensure that all municipalities receiving provincial funds establish services for disabled travellers, an action plan must be submitted to MTC outlining how the funds will be used. For example, in order for municipalities, where public transit is currently available, to qualify for the grant the following service criteria must be met. These service criteria could be modelled after the Section 504 Regulations in the U.S.

   - those physically unable to use public transit must be eligible for special service;
   - service must be provided within 24 hours of a request;
   - restrictions or priorities based on trip purpose are prohibited;
   - fares must be comparable to those charged for the general public;
   - hours of service must be comparable to those available to the general public;
   - the area served must be comparable to that served for the general public.

4. **Municipal Grant Amount**: This will be determined by the actual catchment population of the municipality. For instance, MTC will set aside a fixed pool of resources committed to providing municipal grants. The grants will then be allocated based on the population of the municipality. This allocation assumes that the disabled population is evenly dispersed throughout Ontario. Some

flexibility must be maintained in determining the municipal grant amount as initial start-up costs of a paratransit service are high in the first year due to high capital expenditures.

5. **Technical Support:** In coordination with this option, MTC will also set aside a budget to provide technical support. This support might include socio-economic studies, existing vehicle information, R&D support etc. As municipal transportation planners do not have the technical expertise and information on which to assess all alternatives they will rely on MTC to provide them with this technical support. This will ensure effective utilization of the grant.

6. **Municipality Assessment:** To utilize the grant most effectively transportation planners within the municipality will have to assess current services provided to the disabled population. This assessment will have to determine whether more coordination between existing systems and service providers can be accomplished. In fact in rural areas where the population is low the grant may not be large enough to fund a paratransit system, but instead, can be most effectively spent by allocating to the actual eligible individuals.

(17).4 RELEVANT CURRENT INITIATIVES

- MTC specialized transit subsidy;
- Capital subsidies for public transit upgrades;
- Sales tax exemptions;
- Tax rebates on vehicles;
- GAINS-D and other COMSOC individual subsidies.

The MTC paratransit subsidy is by far the largest of the relevant initiatives in cost. The cost of the municipal grant system is compared to the funding for specialized transit service.

(17).5 TOTAL MARKET SERVED

Although the recipients of transportation funds will be determined by the municipalities, for the sake of argument here, an "equivalent-to-specialized-transit" assumption is made. In other words all those "unable to use" public transportation (if it were available) are eligible. All municipalities which do not have specialized service will receive funding. This represents 25%[35] of Ontario, or 25,700 disabled travellers.

---

[35] Note that Option (15) assumed only 20% for penetration of an extended specialized transit service.

(17).6 MARKET NEED SERVED

At a rate of 31.5 trips/year/user (on specialized service), the total trips will be 819,000 per year.

(17).7 UNIT COSTS

Again, following the specialized transit model, 50% of a typical trip is subsidized. With a total unit cost of $8 or $7.30, excluding fares, (as calculated in Option (15)), this gives $4/trip paid by MTC.

Note that various arrangements could be made by the municipality, representing different target groups and/or trip-making potential. This calculation is shown as an example only.

(17).8 TOTAL COSTS

The subsidized amount totals $3.3M/year, from MTC. If the municipalities follow the specialized transit model, they will contribute a further $2.8M/year (42%), for a total of $6M/year.

In 1996, the total MTC portion would be $6.5M, and over 30 years, the total present valued costs would be $62M.

As an example, Haliburton County does not operate a specialized transit service, and thus does not receive a specialized transit subsidy. Haliburton would receive a grant of $28,000. Although this grant is not large enough to start-up a paratransit service, it could be allocated to individuals to put towards a vehicle purchase. For instance, in the County there are approximately 120 individuals who "cannot use public transportation" (based on 1.2% of population). Each of these individuals would receive approximately $230 per year to help cover their transportation costs. They might put this money towards a vehicle purchase, or use it for taxis, etc.

Some consideration can be given to providing new service to remote areas. This will require flexibility in their grant mechanism to take into account the high start-up costs of such a venture (ie. more in early years, less in later years).

(17).9 QUALITY OF SERVICE

The quality of service will improve. The improved quality of service will be a result of each municipality assessing the current situation, and identifying areas that should receive financial assistance but do not under the current system.

(17).10 LEVEL OF SERVICE

The level of service will be high, as each municipality which applies for a municipal grant will have to submit an action-plan describing how the funds will be used. MTC will ensure that minimum service criteria are met.

(17).11 DEVELOPMENT RISK

These is development risk associated with the lack of technical experience each municipality has in identifying the needs of the target population in their municipality. This will be minimized by MTC allocating a budget to provide technical support. Municipal transportation planners do not have the technical expertise and information (socio-economic studies, existing vehicle information, R&D support) on which to base decisions and thus will rely on MTC to provide them with technical support.

(17).12 COMPATIBILITY WITH OPERATOR'S MANDATE

Refining the existing paratransit subsidy, through allocation of municipal grants is within the mandate of MTC.

(17).13 SYSTEM COMPATIBILITY

The municipal grant system provides the municipality with the flexibility to fund and package services which they deem to be compatible, and meet the needs in the municipality.

(17).14 SAFETY CONSIDERATIONS

(Not applicable).

(17).15 PUBLIC ACCEPTABILITY

(Not an issue).

(17).16 HUMAN RIGHTS

(Dependant upon the municipalities selection of modes).

(17).17 SUMMARY

The pros of this initiative are:

- Decentralized system will allocate responsibility of providing service to municipal transportation planners who know the gaps and inefficiencies within the current system;
- Incremental costs over existing specialized transit subsidy costs are not substantial if municipal grants are allocated throughout Ontario; (this includes the cost of providing technical support.)

- Requires municipality to assess existing system and provides incentive to use the grant effectively;

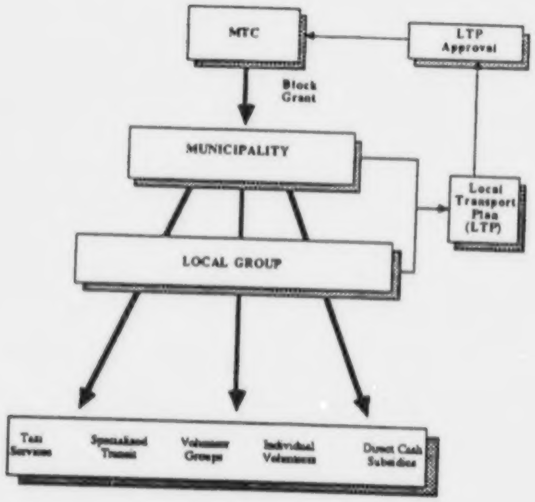
- MTC will provide technical support;

- Areas without specialized transit service will receive a grant proportional to areas with specialized transit service.

The cons of this initiative are:

- Municipalities will be able to identify the gaps in the service but may have difficulty in choosing between alternatives as they lack the technical support/information.

USE OF BLOCK GRANTS TO RURAL MUNICIPALITIES


MTC
LTP Approval
Block Grant
MUNICIPALITY
Local Transport Plan (LTP)
LOCAL GROUP
Taxi Services
Specialized Transit
Volunteer Groups
Individual Volunteers
Direct Cash Subsidies

Alternatives:

- The formation of a local advisory group to assist the municipality in allocation of funds is optimal.
- MTC could give the grant directly to a recognized group which runs a volunteer or specialized service.

INTERCITY OPTIONS

OPTION (18): ACCESSIBLE INTERCITY BUSING

(18).1 SECTORS:

- Intercity

(18).2 TARGET GROUPS :

- Those unable to board public transportation

(18).3 DESCRIPTION

As shown in a JFH socio-economic study [17] of various options, lift-equipped buses are more cost effective than station-based lifts or parallel services, for most intercity bus routes.

The objective of this option is to provide for the integration of accessible busing with existing provincial intercity routes. The initiative would involve an MTC subsidy to carriers for 100% of the capital costs for lifts on buses. The initial goal is limited accessible bus transportation on major Ontario routes[36] within two to four years, affecting the main carriers in Ontario: Voyageur and Gray Coach. Ultimately, all carriers would purchase lift-equipped buses under this scheme.

There are many disabled individuals who are unable to board intercity buses, and have few reasonably priced options in travelling medium-to-long distances. Air travel is expensive, and the rail system is only partially accessible. Neither of these modes provides reasonable service to smaller urban or remote rural centres.

The stated objective can be achieved through several initiatives: (i) regulation, and/or (ii) tax exemptions on the purchase of accessible equipment, and/or (iii) subsidy of capital expenditures (purchasing lift-equipped buses, retrofitting existing buses or utilizing station-based lifts).

The proposed policy initiative would call for limited accessible bus transportation (one bus per day, for example) on major Ontario routes, within some medium-term frame (such as two to four years). A major route would be defined in terms of ridership. (The following origin destination pairs serve in excess of 200,000 passenger kilometers weekly: Ottawa - Toronto, Toronto - Kingston, Toronto-Guelph, Toronto - Kitchener, and likely several of the GO Transit routes.) Accessibility on all routes would be a long term policy goal.

The medium-term initiative above would affect the three main carriers in Ontario: Voyageur, Gray Coach and GO Transit. (Note that the GO case is addressed in more détail in Option (22). Therefore GO Transit will not be addressed further here.)

---

[36] With emphasis on corridors unserved by other accessible services.

In addition to regulation, as part of the proposed option, MTC would subsidize up to 100% of capital costs related to accessibility (over-and-above existing federal subsidies).

(18).4 RELEVANT CURRENT INITIATIVES

Several activities and programs which relate to this subject are listed below:

- The recently-developed Accessobus is being demonstrated in service with various carriers across the country. (Appendix E.2.10)
- The industry (through the Canadian Motor Coach Association) is in the process of submitting practical "adaptation" plans with the Canadian Human Rights Commission. (E.4.3)
- Transport Canada is investigating alternative station-based and bus-mounted lifts. (E.2.10)
- The federal government will subsidize the retrofit of one bus per fleet to make it accessible, for interprovincial carriers. (E.2.3) However, carriers have not yet utilized this program.
- Lift purchases are federal and provincial sales tax exempt. (E.1.4, E.2.2)

Most of the above incentives and activities are small, and seem to be having little effect. The provincial government has an opportunity fill a significant gap in the current situation for disabled travellers. Intercity bus regulation is within the jurisdiction of the Ontario government through the Ontario Highway Transport Board (OHTB).

The federal government, through James F. Hickling, recently completed a socio-economic study of accessible intercity busing [17]. This work is a detailed comparison of the demand, costs and benefits associated with various options for accessible intercity busing in Canada. The four options considered were: lift-equipped buses, station-based lifts, parallel services and direct subsidies.

The study concluded that, for virtually all route characteristics and demand scenarios, that the lift-equipped bus option is most cost effective. This overall conclusion is equally relevant to the Ontario situation.

(18).5 TOTAL MARKET SERVED

The target market for this option is similar to that defined for other options: the lower bound demand is based on those in Group A, the upper bound based on Group C, both modified for trouble using intercity buses. The methodology for calculating potential uptake is based on actual CHDS data on uptake for the travellers in the particular group, applied to those in the group who might take intercity buses.

In other words, the demand is calculated by taking (i) those who do not know if they have trouble with buses, plus (ii) those who presently do not travel. Both sub-groups ((i) and (ii)) are corrected for the incidence boarding trouble and for typical uptake rates (those who choose to take the bus). Specifically, the steps are as follows:

Step (i) Start with those who do not know if they have trouble taking intercity trips.

Step (ii) Estimate the proportion who would have trouble with boarding the bus.

Step (iii) Estimate the proportion who would **choose** to travel.

Step (iv) Results in the total number of potential "unknown" travellers (in a three month period).

Step (v) Start with those who take zero trips.

Step (vi) Estimate the proportion who have trouble with boarding the bus.

Step (vii) Estimate the proportion who would **choose** to travel, if lift-service was available.

Step (viii) Results in the total number of potential "zero trip" travellers (in a three month period).

Step (ix) Add (iv) and (viii).

Step (x) Calculate the average number of trips taken, by those who did travel. (From the "all disabled" group, due to lack of data on smaller groups.)

Step (xi) Calculate the three-month demand. (Multiply (ix) by (x).)

Step (xii) Calculate the total potential demand for one year in Canada. (Multiply (xii) by 4.)

Step (xiii) Convert (xii) to a daily demand (1983/84). Divide by 365.

Step (xiv) Convert (xiii) to a 1986 day demand. Multiply by 1.083.

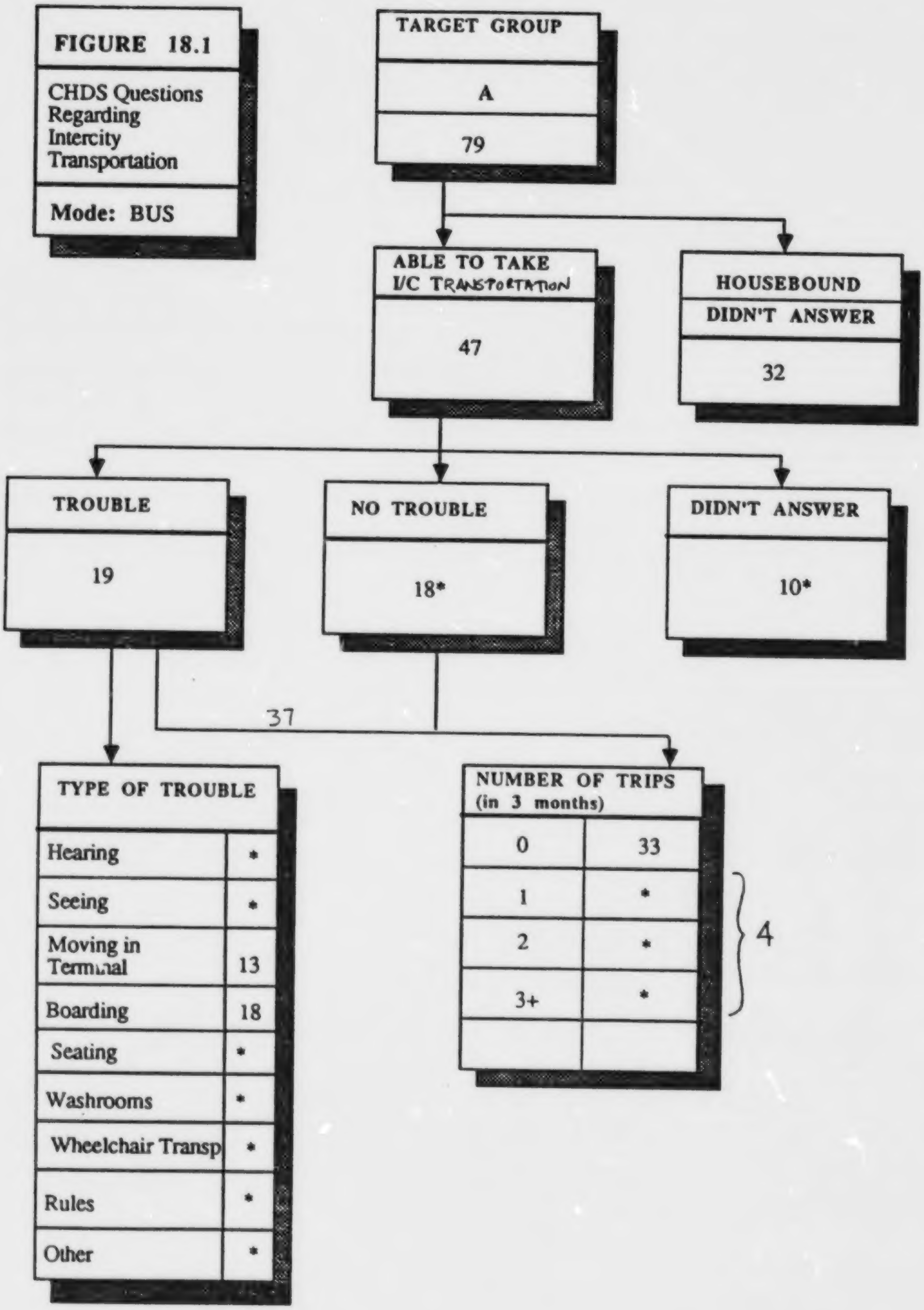
Figures (18).1 and (18).2 show the logic of the CHDS questions, and the numbers relevant to these steps.

The results of this methodology are shown in Table (18).1, giving a range of demand from 91 to 156 trips per day across Ontario.

FIGURE 18.1

CHDS Questions Regarding Intercity Transportation

Mode: BUS


TARGET GROUP
A
79
ABLE TO TAKE I/C TRANSPORTATION
47
HOUSEBOUND
DIDN'T ANSWER
32
TROUBLE
19
NO TROUBLE
18*
DIDN'T ANSWER
10*
37
4

TYPE OF TROUBLE	
Hearing	*
Seeing	*
Moving in Terminal	13
Boarding	18
Seating	*
Washrooms	*
Wheelchair Transp	*
Rules	*
Other	*

NUMBER OF TRIPS (in 3 months)	
0	33
1	*
2	*
3+	*

FIGURE 18.2

CHDS Questions Regarding Intercity Transportation

Mode: BUS

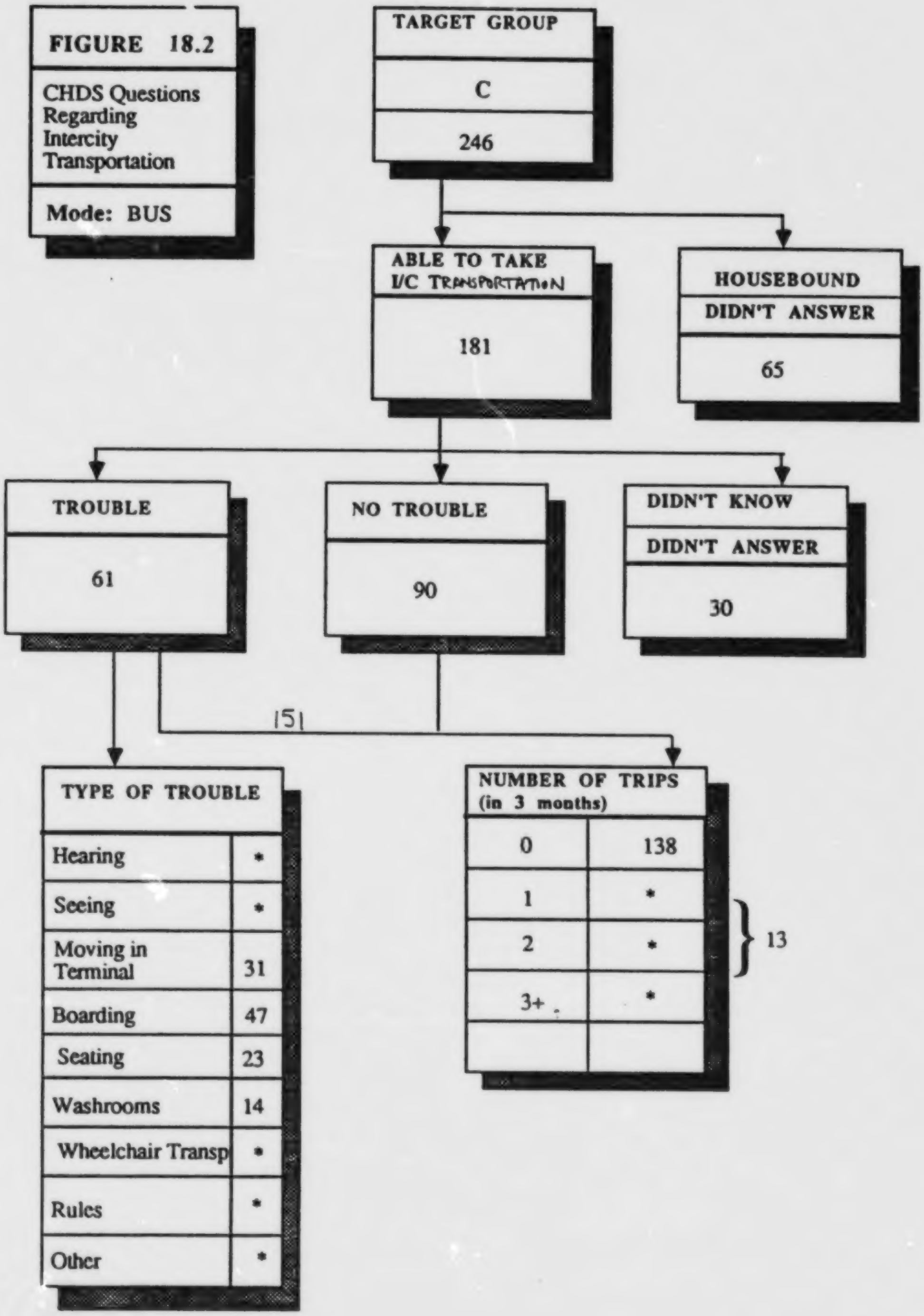

TARGET GROUP
C
246
ABLE TO TAKE I/C TRANSPORTATION
181
HOUSEBOUND
DIDN'T ANSWER
65
TROUBLE
61
NO TROUBLE
90
DIDN'T KNOW
DIDN'T ANSWER
30
151
TYPE OF TROUBLE
Hearing *
Seeing *
Moving in Terminal 31
Boarding 47
Seating 23
Washrooms 14
Wheelchair Transp *
Rules *
Other *
NUMBER OF TRIPS (in 3 months)
0 138
1 *
2 *
3+ *
13

TABLE (18).1 POTENTIAL DEMAND

Step	Description	Group A Calculations	Group C Calculations
(i)	Total "Unknown"	10,000	30,000
(ii)	Correct for "Trouble Boarding"	* $\frac{18}{37}$ =49%	*$\frac{47}{151}$ =31%
(iii)	Correct for uptake (choice)	* $\frac{4}{37}$ =11%	*$\frac{13}{151}$ =9%
(iv)	Total potential "Unknown" users = (over 3 months)	530	= 800
(v)	Total taking zero trips	33,000	138,000
(vi)	Correct for "Trouble Boarding"	* $\frac{18}{37}$ =49%	*$\frac{47}{151}$ =31%
(vii)	Correct for uptake (choice)	* $\frac{4}{18}$ =22%*	*$\frac{13}{90}$ =14%
(viii)	Total potential zero-trip users = (over 3 months)	3,570	= 6,200
(ix)	Total potential travellers in 3 months; (iv) + (viii)	4,100 ave 5,600	7,010
(x)	Average trips/traveller (3 mo.)	x 1.87	x 1.87
(xi)	Potential demand (3 mo.) (x) x (ix)	= 7,770	=13,100
		x 4	x 4
(xii)	Total potential annual demand	= 30,700	=52,400
(xiii)	Daily demand, 1983	84 trips/day	144 trips/day
(xiv)	**Daily demand, 1986**	**91 trips/day**	**156 trips/day**

* Assumes incidence of take-up by those who have trouble is equal to the take-up by all those disabled who can use.

Verification of Demand Estimates

The demand estimates have been verified by comparison with four other data sets:

- The demand values for wheelchair users, based on the same (CHDS) methodology;
- The demand for the Newfoundland TerraTransport service;
- Canada-wide demand for intercity bus services by the general populace; and,
- The Labour Force Survey [4].

The details of the comparisons for the first three items can be found in [17].

The Labour Force Survey cites 5,800 intercity bus travellers in Ontario who require manual or mechanical lifts. At an individual trip-making rate of (1.87 x 4) 7.5 trips/year, this converts to a total of 119 trips/day. These numbers agree quite well with our CHDS based estimates (91 to 156 trips/day).

(18).6 MARKET NEED SERVED

The particular market need served is the intercity traveller who "cannot board". The estimated total is 4,100 to 7,000 disabled persons, as calculated above. For 1986, the Group A value is 4,400 (with a corresponding 33,000 trips).

The type of trip which intercity busing provides is the low-cost, medium distance routes. The automobile is the only alternative in most cases.

(18).7 TOTAL COSTS

The approach taken here is based on a global Ontario snapshot, using the total demand to ascertain the required number of accessible bus purchases and terminal modifications, irrespective of regional distribution of trips. Assumptions with regard to a reasonable rate of penetration of accessible buses and terminals for each major and minor carrier are made. (Specific routes are not considered.)

Costs are itemized below. Items (1) through (3) are capital costs, (4) through (10) are operating and maintenance costs, and (11) is transfer costs.

(1) Accessible Bus Purchase

With a demand of 91 - 156 trips/day, distributed across the province, many accessible buses are required. Although a number of the trips will be "dispersed" (different routes and different times), it is unreasonable to expect 91 - 156 accessible buses to be procured at "year one".

There are two major carriers in Ontario (aside from GO Transit): Voyageur and Gray Coach, plus approximately 40 minor carriers (including Greyhound, Ontario Northland, Grey Goose, Canada Coach Lines and PMCL). At a purchase rate of 3 accessible buses per year for the majors, and 1 accessible bus per 8 years for the minors, it would take 8 - 14 years to develop a fleet that would adequately handle the projected demand (assuming one bus per daily trip).

The incremental cost of the MCI Accessobus is $25 - 40K, giving capital expenditure for lifts of $75 - 120K/year for each of the majors, and $13 - 20K for the minor carriers. Thus the total annual capital costs are:

- lower bound (75 x 2) + (13 x 10) = $280K
- upper bound (120 x 2) + (20 x 10) = $440K.

Note that these capital requirements are independent of demand.

(2) Displaced Lost Seats

Use of the accessible bus by wheelchair passengers during peak periods will create a loss of seats. Many carriers have a "nobody stands" policy; i.e. if a bus is full they merely bring another bus into service. The difficulty comes in estimating the frequency that a wheelchair user and one-to-three extra able passengers wish to travel the same run. (If there are more than three extra passengers, an extra bus would be required anyway.) Several important points are made here:

- less than 50% of the target group are in wheelchairs (46 to 78 trips/day across the province);
- buses average only 48% capacity;[37]
- for high capacity routes, extra buses are frequently brought in.

In considering these factors, it is concluded that the number of extra buses required is negligible.

There are no changes in schedules or quality of service for the general population, and thus there is no lost ridership.

(3) Terminal Modifications

As calculated in Option (22) (Accessible GO Bus System), upgrades are calculated to cost $104,000 per terminal. As with the bus lifts, it is unreasonable to expect all terminals to be modified in the first year. For the purposes of this study, 4 terminals per year are assumed to be converted, for a province-wide total of $416K per year.

(4) Operator's Time

Neither Acadia (in the Accessobus demonstration) nor TerraTransport assumed any increase in operator time due to operation of their lift equipment. However, in busier terminals, some time must be allocated for preboarding and moving buses from adjacent bays. An average of five minutes per preboarding and $20/hour, the cost per trip is $1.67. (Deboarding is not assumed to cost extra labour).

---

[37] Estimate by several national carriers and Transport Canada.

If 50% of the boardings are in "busy" terminals, the total annual cost is:

Cost/trip	$1.67
Total trips	x 91 - 156/day
Busy terminal trips	x 50%
Days/year	x 365
Annual Cost	= $28K - 48K

(5) Lift Maintenance

As substantiated in the GO studies, and in TerraTransport experience, maintenance costs of $500/lift/year are assumed. The number of lifts in "year one" is 11 and in a mature system is 91 - 156. These requirements gives an average number of lifts of 51 - 84 or $26 - 42K/year.

(6) Parcel Express Revenue

A significant portion (25%) of intercity bus carriers' revenue comes from parcel express. Longer haul buses typically run seventy-five percent full (in the cargo compartment), averaged over the year. On shorter haul routes, this is significantly lower. The Accessobus, when in use, occupies one-sixth of the total cargo space. This converts to approximately one-hundred parcels "lost" per lift-trip if the cargo compartment is full. The difficulty lies in predicting how frequently the cargo compartment is more than five-sixths full, and how often such a situation occurs at the same time as the lift is required. Seventy-five percent full, all of the time, is significantly different than one-hundred percent full, seventy-five percent of the time!

The assumptions made here are:

(i) On short haul routes, a one-sixth loss on one or two buses per day can be accommodated (ie. there is no loss of cargo revenue);

(ii) For the long haul routes, upper bound, there is a 6.25% loss in cargo revenue for each trip or 6.25 parcels); based on the average of two scenarios:

- the cargo space is 75% full, 100% of the time; therefore no loss in cargo space (because the lift occupies 17% of the space);
- the cargo space is 100% full, 75% of the time; with a loss of 17% of the space, 75% of the time, or a 12.5% net loss in space.

(iii) For the long haul routes, lower bound, operators will unload/load the cargo as required to use the lift. The number of occurrences is one half of the 6.25% above, or 3.1% of all trips. The operators' wages involved (including coordination/scheduling) are estimated to be 30 person-minutes, giving a cost of $10 per occurrence, or $.63 averaged per trip.

(iv) 20% of the routes in Ontario are "long haul", i.e. where cargo space is a premium.

(v) The average revenue from long haul parcel express is $5 (based on carriers' estimates).

The calculations are as follows:

Item	Lower Bound	Upper Bound
No. of accessible trips/day	91	156
Percent Long Haul trips	* 20%	* 20%
(1)No. of long-haul trips	= 18	= 31
No. of parcels lost per trip	--	$6.25
Cost per parcel	--	* 5
(2)Cost per long-haul trip	= $0.63[38]	= $31.25
Cost per day(1)*(2)	$11.3	$969
Cost per year	$4.1K	$354K

Note that the upper bound costs are very high. The assumptions are obviously critical, but difficult to substantiate without a thorough review of particular parcel express characteristics of all Ontario routes.

(7) Reservation Service

As discussed in the GO Accessible Bus work, Option (22), the cost of processing a reservation is estimated at $5 in labour, plus a minimal capital outlay. The global cost thus ranges from $153K - 263K (corresponding to a daily demand of 91 - 156 trips).

(8) Information Dissemination

The major carriers are assumed to spend $5K/year each on schedule updates, contacts with user groups and governments, etc. For the minor carriers the budget is estimated at $1K/year, for a overall total of $20K/year.

(9) Training

Drivers, mechanics and staff must be trained in the operation & maintenance of the lift and general information of the service. The labour costs are estimated as follows:

---

[38] See assumption (iii).

Individuals & Time Required	Number Required Major Carriers	Minor Carriers
Drivers @ 1 day	8	1
Mechanics @ 3 days	2	1
Terminal Staff @ 1 day	5	--
Total person days	19	4

At $600/person day for lost wages, trainers and materials, this gives $11.4K/year for the major carriers, plus $2.4K/year for the minors. ($47K total).

(10) Terminal Equipment Maintenance

Automatic doors, washrooms, signage, etc. installed at terminals will require some maintenance. The capital costs are $104K/terminal, and the corresponding maintenance costs are assumed to be minimal, $1.3K/terminal/year. The buildup of accessible terminals is 4 per year, to a total of approximately 60 terminals. Averaged over the 15 year period, the maintenance costs are $42K/year.

(11) Transfers

As calculated in Option (24), the average cost for all feeder trips to and from bus terminals ranges from $5.14 - $7.38/trip. With 2 feeder trips per intercity trip, the totals are as follows:

No. trips/day	91 - 156 * 2
No. feeder trips/day	= 182 - 312
Cost/feeder trip	* $5.14 - $7.38
Cost/day	= $935 - 2,303
Cost/year	$341K - 840K

Summary of Total Costs

The above items are listed and totalled in Table (18).2 below. The total annual costs (for all carriers, province wide) are $1.36M to $2.51M per year, over the first 15 years, or $1.9M per year average. MTC would assume $780K per year, and the carriers an additional $570K per year ($1.4M per year total).

The corresponding total in 1996 would be $2.5M per year. Over 30 years, the cost of this option would be $13M.

TABLE (18).2: TOTAL ANNUAL COSTS: ACCESSIBLE INTERCITY BUS SYSTEM

Cost Component	Lower Bound	Upper Bound
Capital Costs		
(1) Accessible Bus Purchase	$ 280K	$ 440K
(2) Displaced & Lost Seats	--	--
(3) Terminal Mods	416	416
Subtotal, Average (MTC)	**$776K**	
O & M Costs		
(4) Operator Time	$ 28K	$ 48K
(5) Lift Maintenance	26	42
(6) Parcel Express Revenue	4	354
(7) Reservation Service	153	263
(8) Info Dissemination	20	20
(9) Training	47	47
(10) Terminal Equip. Maint.	42	42
Subtotal, Average (Carrier)	**$569K**	
Other Costs		
(11) Transfers	$ 341K	$ 840K
Subtotal, Average (User)	**$591K**	
TOTAL ANNUAL COST	$1,357k	$2,512k
AVERAGE ANNUAL COST	**$1,935K**	

It is assumed that MTC subsidizes 100% of the capital costs, carriers pay for the O & M, and users assume the transfer costs.

(18).8 UNIT COSTS

The proposed initiative will effect 4,100 to 7,000 individuals (1983)[39] once it is fully developed. The cost converts to $331 - $360 per person per year, or an estimated $41 - $44/trip. Note that these unit costs are for the accessible additions only, and do not include the normal fare. (If normal fares are excluded, the unit cost is $39/trip.) The unit costs do include feeder costs ($10.30 to $14.80 per intercity trip).

(18).9 QUALITY OF SERVICE

Boarding an intercity bus via a station-based or a bus lift will present some mental discomfort. However, this situation is vastly superior to manual lifting or to typical difficulties with stairs. Once on board, the quality of the service is comparable to most modes. It is assumed that operators would be trained in the needs of disabled travellers and in use of the lifts.

(18).10 LEVEL OF SERVICE

The geographic range and destination options provided by intercity buses are superior to those of its "competitors": trains and short-hop airlines. Reservations, perhaps even 2 or 3 days in advance will be necessary due to the limited number of buses that will be accessible. This is slightly more restrictive than for air or rail travel. The speed of service is comparable to trains, and possibly even short-hop airlines depending on the transfers required.

Intercity bus rates poorly in comparison to the automobile in each of the LOS criteria, with the possible exception of speed of service, which also depends on transfers.

(18).11 DEVELOPMENT RISK

Canadian bus lift technology has been proven in the Accessobus, to the extent that Motor Coach Industries (MCI) of Winnipeg has sold 58 units to Boston and San Francisco. Further demonstrations are underway in Canada.

There is some uncertainty in the demand and cost estimates, especially with respect to ridership. The specific problem lies not in predicting uptake of the service (which is difficult in any analysis), but the fact that this uptake has a multiplicative effect on lost ridership.

(18).12 COMPATIBILITY WITH OPERATOR'S MANDATE

The accommodation of disabled persons is within the mandate of intercity bus companies. They have already instituted manual lift policies, and, in keeping with the Human Rights Act, will likely ultimately have to provide independent boarding capability.

---

[39] The average, converted to 1986 values, is 6,010 persons.

(18).13 SYSTEM COMPATIBILITY

Major terminals must be accessible in this scheme. It is unreasonable to make small stations or stops accessible; deboarding in remote areas is not a difficulty in use of the lift. Responsibility for pickup must be assumed by the individual.

The increased boarding time required with a lift should present no problems for system schedules due to the relatively lengthy layover period at most stops, and the assumption of preboarding.

Feeder service (to the terminals) is a factor for most intercity travellers, and is a significant component of the cost.

(18).14 SAFETY CONSIDERATIONS

The new technologies under consideration are being fully tested with respect to safety. This is not seen as an issue. As an example, wheelchair tie-downs are designed in as part of the system.

(18).15 PUBLIC ACCEPTABILITY

As long as able-bodied passengers are able to complete their trips, this initiative would be fully acceptable. In fact, the inclusion of disabled passengers on buses would, in all likelihood, be a boon in marketing for the carrier.

(18).16 HUMAN RIGHTS IMPLICATIONS

Unless intercity bus services take some action, or provide some plan in the near future, it is anticipated that legal action re inaccessibility to the non-ambulatory is inevitable.

(18).17 SUMMARY

The pros of this initiative are as follows:

- It is relatively low cost, and the costs will ultimately be borne by all users in the form of minimal increases in ticket price.
- For medium-length trips, intercity buses provide a level of service superior to all other modes, with the exception of the automobile.
- The development risk is not as large as carriers perceive it to be.
- The penetration and costs of the accessible service can be phased in over time.
- With increased penetration, intercity buses will help a particularly needy group - the rural disabled.

The cons are listed below:

- The initiative represents government intervention in an industry which is largely free-market driven. There seems to be a reluctance to proceed on the part of the industry, which may be magnified with talk of "outside pressure".
- There is significant overlap in jurisdiction and policy initiatives with the federal government. In fact, a joint program may be a necessity.

OPTION (19) DESIGN IMPROVEMENTS FOR AMBULATORY PASSENGERS

(19).1 SECTOR:

- Intercity.

(19).2 TARGET GROUP:

- Those who use public transportation with difficulty.

(19).3 DESCRIPTION

This option is virtually identical in rationale and content to that proposed for urban public transit systems (Option 11). It involves minor equipment and operational upgrades to buses and terminals, over time, with a fixed budget and schedule.

There is one difference from the urban situation. The Ontario government does not have the same relationship with the private intercity bus carriers as it does with the municipal operators. The province must use either a "carrot" or a "stick" approach. Under the former, the province could subsidize all upgrades; using the "stick" approach it must regulate upgrades, via the OHTB, and such matters as route selection. As the total costs are not large, and they would be reflected in a small increase in fares, the "stick" approach is proposed, whereby the carriers are compelled to make the upgrades within their own budgets.

(19).4 RELEVANT CURRENT INITIATIVES

- Capital retrofit subsidies (Appendix E.1.3).
- PST exemptions - equipment (E.1.4).
- GO Transit (E.1.8).
- Safety Inspection programs (E.1.2).
- Terminal Upgrades (E.2.6).
- VIA Rail upgrades standards (E.2.).

(19).5 TOTAL MARKET

The CHDS data (Appendix C.7) shows that 100,000 disabled persons travel by intercity buses, and that 16% of these people have trouble using. Thus, this option will reach 16,000 persons.

(19).6 MARKET NEED SERVED

The same CHDS source (Table C7.2) shows that those who do use intercity bus travel at a rate of 14.6 trips/year.

TABLE (19).1 TRIP RATES OF DISABLED PERSONS ON INTERCITY BUSES

1 round trip in three months:	55,000 persons
2 round trips in three months	22,000 persons
4 round trips in three months (ave):	21,000 persons
1.83 round trips in three months (ave):	100,000 persons

*2 trips/round trip
*4 three month periods/year

= 15 trips/year/person

For the 16,000 moderately disabled travellers, this option corresponds to 240,000 trips/year.

(19).7 TOTAL COSTS

The minor upgrades to vehicles and stations will occur over time. Assuming a rate similar to that of GO (Option (25)), the cost of this option is approximately $100K/year. These upgrades are paid for by the carriers (and ultimately assumed by users, via ticket prices).

The corresponding 1996 cost is $200K/year. Over 30 years the total cost of the option is $1M, in present valued 1986 dollars.

(19).8 UNIT COSTS

240,000 trips/year are enhanced, with an annual expenditure of $100,000. Thus, the unit cost is $0.42/trip.

(19).9 -- (19).17

Similar to Option (11).

OPTION (20) SPECIALIZED INTER-JURISDICTIONAL SERVICE

(20).1. DESCRIPTION

Many disabled individuals find that there is no adequate means to make non-local trips; in many cases, cross-boundary trips require a seven day advance booking (for existing paratransit) and transfers for each jurisdictional boundary crossing. For those who have the physical strength and endurance, this consumes a great deal of time and physical effort, and loss of dignity and independence; for those who do not have the time or strength, such trips are impossible unless they have access to a private vehicle, or can afford to take a taxi.

This option is based on the coordination and use of existing specialized transit (for the first five years), taxis and limousines (conventional and accessible). The objective is to find, among the modes, a balance between minimizing total cost and providing a level of service comparable to service provided the general public for non-local trips, and still satisfy demand.

The major contrast between this service option and the other GO options concerns the use of fixed routes; while the other systems have specified fixed routes with feeder service and scheduling constraints, this system provides a door-to-door service, with no restriction to the routes used (as long as the trip is within the GO service area), or schedule adherence. This higher level of service will increase significantly the demand estimates for the service, as shown in section 4.0.

Since the service will use predominately existing equipment (capital expenditures will be required for additional vehicles if demand warrants and for new accessible vehicles - see section (20).4.3), the infrastructure will be quite small, primarily consisting of a regional transportation office and the related office equipment. The office will have, as its sole responsibility, the coordination and organization of trips across existing inter-jurisdictional boundaries which are not currently being served by accessible public modes (paratransit). The office could be staffed by GO Transit, or it could be a separate and independent brokerage office.

To ensure the availability of vehicles and a certain degree of control, the service would rely on the establishment of a contract with several regional taxi or limousine companies, and paratransit authorities within the GO catchment region, Table (20).1 identifies existing paratransit in the GO area. Initially, one paratransit operator and at least one taxi company should be assigned to each region; currently three paratransit operators within the GO service area liaise with local taxi operators to supplement service. Further, each taxi company would be required to purchase at least one accessible taxi to accommodate non-agile, non-ambulatory individuals (incentives will be provided to purchase these vehicles - see later). These accessible vehicles could, of coarse, be used for regular use when not needed for the targeted population (the accessible cabs available in Vancouver are in high demand among the general public when large articles such as plants etc. need transporting). This would ensure maximum utilization of the vehicles, while still guaranteeing availability of an appropriate vehicle with minimal lead time (reservation of less than three hours is desirable).

TABLE (20).1: GO AREA PARATRANSIT OPERATING AND COST DATA (1985)

Region	Paratransit Authorities	Revenue Veh-Km	Revenue Veh-Hr	Total Vehicles	Total Cost	Total Rides	Estimated Revenue Passengers	% Unaccom-modated Trips	Recorded Inter-Municipal Trips/Yr
Durham	Ajax-Pickering	136756	5265	4	146259	12722	9060	1	200
	Oshawa	202406	13350	7	268630	32639	23244	0	195
	Whitby	61836	3514	2	64228	5368	3823	0	150
	Newcastle	49000	3333	1	47010	2658	1893	0	
York	Richmond Hill	35704	2697	1	61700	5417	3858	1	
	Markham	90800	6048	3	111280	6176	4398	2	247[1]
	Newmarket	54044	4694	2	80999	14031	9992	0	
Metro-Toronto	Toronto	5538108	264151	116	9718114	483317	344191	11	
Peel	Peel	385579	21033	15	863109	56550	40272	5	500[2]
Halton	Halton Hills	52000	1662	1	51620	7025	5003	0	
	Oakville	64300	4618	3	145691	8980	6395	2	
	Burlington	180000	11400	6	227849	23062	16423	0	115
Hamilton-Wentworth	Hamilton-Wentworth	766000	56300	30	1716000	193000	137444	0.1	
Total		7616533	398065	191	13502549	850945	605994		
Operating Cost/ Hour		$33.92							
Operating Cost/ Passenger		$22.28							
Operating Cost/ Kilometre		$1.77							
Pass/Hour		1.52							
Veh.-Km/Hour		19.13							
Veh-Km/Pass		12.56							

Notes
1) Allows trips into Richmond Hill
2) Serves all of Peel Region
3) Vaughn has just established a paratransit service (Feb. 1987) insert Table (20).1 GO Area Paratransit Operators

Each of the approved operators would be treated just like any other paratransit operator for the purpose of subsidy payment. The eligible user would pay a fare in line with the "equivalent" GO fare plus a premium, or "transfer fee", for the door-to-door service (the rider would show an identification card). The operator would be reimbursed for the balance, plus a premium if the trip was made with an accessible vehicle. In return, the operator would guarantee that the appropriate vehicle would be at the point of departure at the designated time.

The choice of mode used would be based on a combination of the following conditions, in order of importance:

- the trip can be made on the mode with no transfers, and within comparable time to that of conventional public transit;
- advanced reservation and pre-booking constraints can be met; and
- the **total** cost for the trip is within a reasonable limit when all conditions are assessed.

The first two conditions define the feasibility of the mode and the last, the economics. If the mode requires transfers, or takes an unreasonable amount of time, then it should not be used for the trip, no matter how little the cost. On the other hand, if the mode provides an acceptable level of service, but is costly, then a subjective decision must be made based on all "feasible" alternatives. It is anticipated that taxis will accommodate all ambulatory and agile non-ambulatory, with paratransit initially carrying the balance; incentives to entrepreneurs to purchase accessible vehicles/taxis will eventually replace the need for existing paratransit for non-local trips.

A non-local trip would be initiated with a request from a registered user (eligibility is described later) via telephone. The dispatcher would record the following information:

- the passenger registration number for the service;
- name and telephone number;
- preferred time of departure and required time of arrival at destination;
- the origin and destination of the trip;
- the functional status of the passenger (ie. needs a wheelchair for mobility, agile wheelchair user, ambulatory).

Based on this information, the dispatcher would proceed as follows:

1) determine the type of vehicle required by the passenger (from functional status of the rider) and choose among the providers assigned to the region the one that has the appropriate vehicle available that can meet the trip needs within the required time frame;

2) provide the operator with the details of the passenger's trip (in all instances the dispatcher would try to organize trip-making to minimize dead-heading);

3) once the trip is confirmed, the dispatcher notifies the passenger of the type of transport arranged, the timing of pick-up, the approximate cost and so on. The trip is made, and the operator invoices the brokerage service for the balance of the trip cost, which in turn invoices MTC for a subsidy.

(20).2 APPROACH

The two basic components required to assess operational and economic feasibility are demand and cost. Demand is required to assess operational feasibility and capacity requirements of the system. The infrastructure required to satisfy the demand determines the total cost of the service, and combined with total demand, cost per trip can be estimated.

(20).2.1 Demand

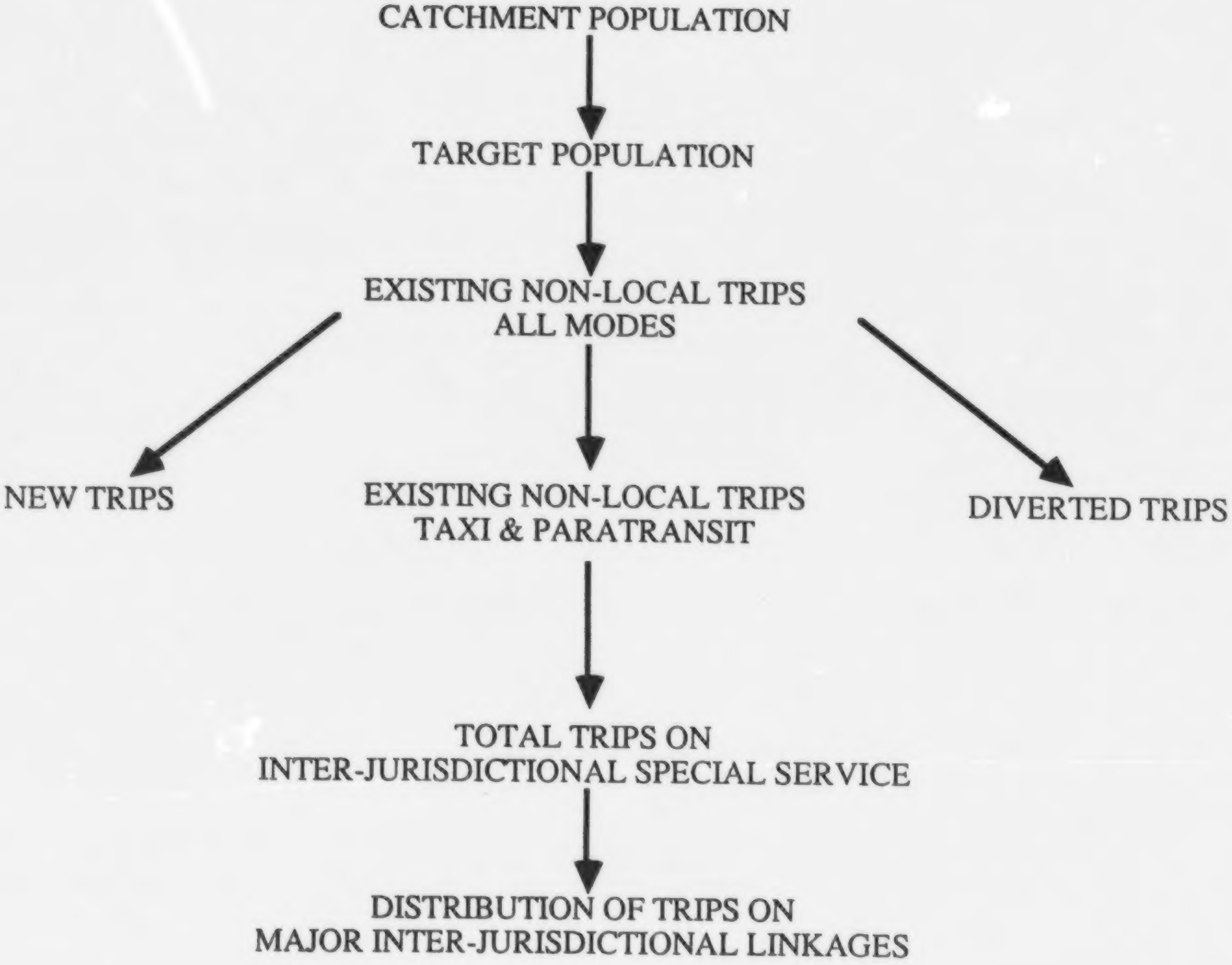
The approach for calculating demand, because of the nature of the option, is slightly different than that of the other options. Figure (20).1 shows the structure of the approach, and the decision-making process at each step.

The first step is to define the catchment for this service. Since the service is door-to-door, theoretically all people within the GO service area should be included in the catchment; however, since only non-local trips are made on the system, and since the majority of non-local trips are from outside regions into Metro Toronto, Metro is **excluded** from the catchment. The few who reside in Metro and travel from Metro to outside regions (10% of the total trips) are added in at the trip calculation stage.

The target includes those in Group B as defined in the market assessment. So that the estimate of who will actually use the system is realistic, the incidence of Group B is increased slightly to account for those who "slip" into the system. The resulting incidence of trips per day per catchment population is applied to the catchment to get potential users, or target.

Using figures from the Halton study [20] on the incidence of non-local trips in the Halton region, an incidence of non-local trips per target population is determined. The incidence is then applied to the target population to obtain an estimate of the total number of non-local trips for **all** modes of travel within the catchment; this **potential** demand is then used to estimate ridership on the taxi/limo system. Ridership is calculated for three components: existing trips, new trips and diverted trips. Existing trips are current non-local trips using paratransit, special agencies and taxis; it is assumed that the new service will incorporate these existing trips. New trips are those trips generated as a result of the new service, and is derived as a percentage of total potential demand based on observed incidence elsewhere (see Table C10.1); this approach is an attempt to account for latent demand--individuals who currently do not make non-local trips by any mode because of the unavailability of the appropriate mode or inability to use existing modes. Diverted trips consist of existing non-local trips using modes other than special transit or

FIGURE (20).1: APPROACH


CATCHMENT POPULATION
TARGET POPULATION
EXISTING NON-LOCAL TRIPS ALL MODES
NEW TRIPS
EXISTING NON-LOCAL TRIPS TAXI & PARATRANSIT
DIVERTED TRIPS
TOTAL TRIPS ON INTER-JURISDICTIONAL SPECIAL SERVICE
DISTRIBUTION OF TRIPS ON MAJOR INTER-JURISDICTIONAL LINKAGES

taxi that are diverted to the new service. The incidence is based on actual observation, and is in terms of a percentage of total potential demand (see Table C10.2). The sum of the three provides an estimate for total trips on the new service.

The final step in the demand calculation is to distribute the total number of daily one way trips over the different linkages (cross boundary trips) that are possible in the GO catchment. Only major linkages are considered (more than two percent of total ridership). The boundaries of concern are those that are defined by the service areas of existing paratransit jurisdictions. Generally they coincide with municipal boundaries, and in a few cases with regional boundaries (see Figure (20).2). Thus, linkages can and do occur at both municipal and regional boundaries. For these reasons, linkages are defined at both levels, but are treated similarly when costed (ie. cost is based on distance travelled).

(20).2.2 COSTS

Capital expenditures are spread over time (the period depending on the equipment). A 30-year study life is assumed, and total costs are present-valued to 1986 dollars.

In order to judge the budgetary implications of this option, one-time capital costs and the recurring operating and maintenance costs associated with the various investments need to be shown separately in constant dollars. This is because door-to-door specialized service displays a profile of low "start-up" costs with relatively higher operating costs when compared to access to fixed-route options which are characterized by high one-time capital expenses and relatively lower operating costs. However, in order to make valid comparisons between alternatives with such disparate life-cycle cost profiles, it is also necessary to compare the present value of their combined capital and operating costs over the full economic lives of the investments.

The results are presented to reflect both total (economic) trip costs associated with this option, and the budgetary characteristics of the option. In this option, fares are deducted from total costs.

The major cost item in this option is the variable cost of door-to-door service. The ridership on each of the linkages is distributed among the various modes of service: paratransit,taxi/limousine and accessible taxi/limousine (paratransit is eventually replaced by accessible taxi), each with their own variable cost. Using this, the average distance of the linkage, and the demand for the mode over the linkage, a total cost is calculated for each linkage. The costs for each linkage are then totaled to provide a total variable cost. Revenues from fares are calculated similarly and subtracted from these costs. Capital and incidental costs are added to give total annual costs.

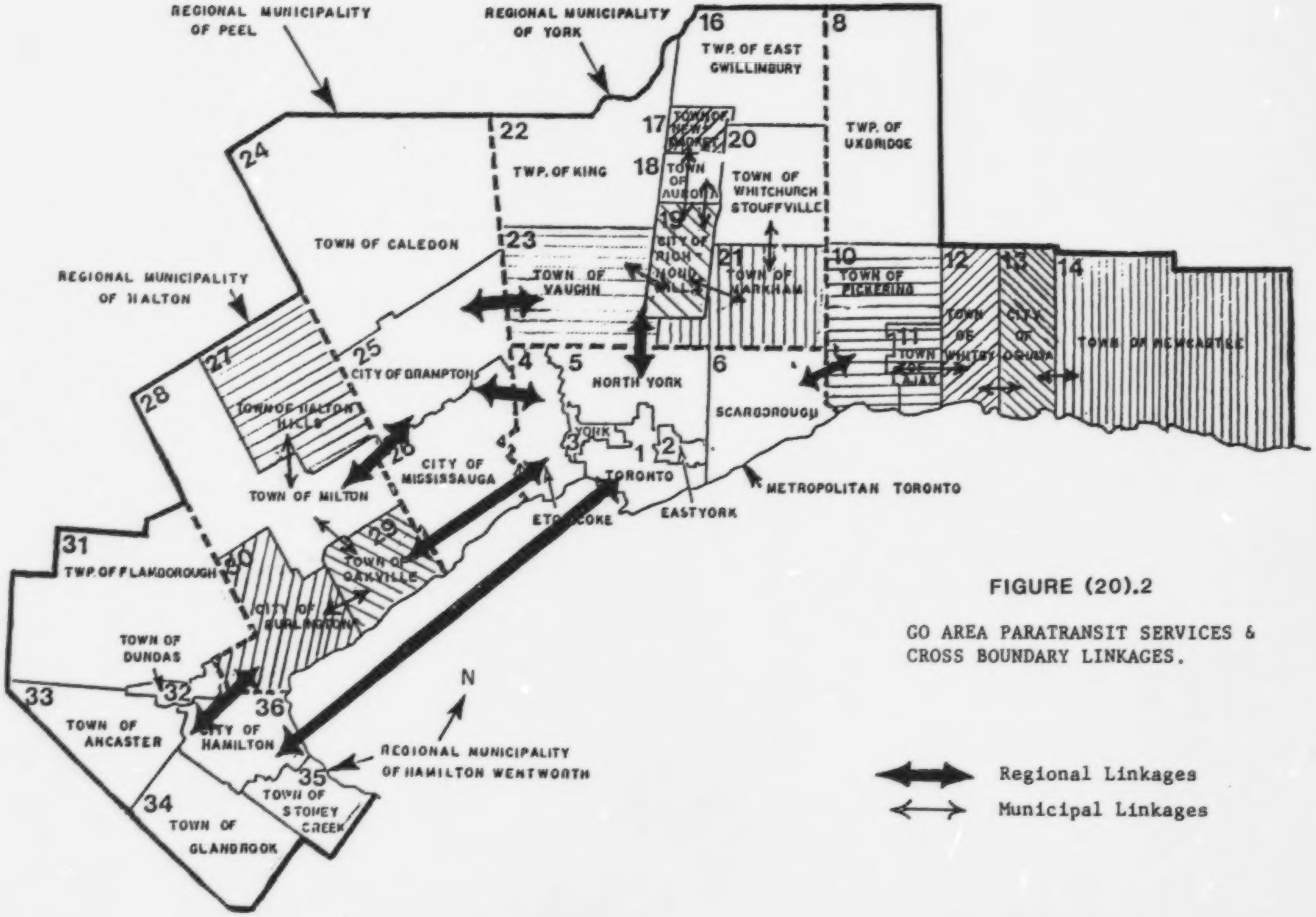

REGIONAL MUNICIPALITY OF PEEL
REGIONAL MUNICIPALITY OF YORK
REGIONAL MUNICIPALITY OF HALTON
REGIONAL MUNICIPALITY OF HAMILTON WENTWORTH
METROPOLITAN TORONTO
16 TWP. OF EAST GWILLIMBURY
8 TWP. OF UXBRIDGE
17 TOWN OF NEWMARKET
18 TOWN OF AURORA
19 CITY OF RICHMOND HILL
20 TOWN OF WHITCHURCH STOUFFVILLE
21 TOWN OF MARKHAM
22 TWP. OF KING
23 TOWN OF VAUGHN
24 TOWN OF CALEDON
25 CITY OF BRAMPTON
26 CITY OF MISSISSAUGA
27 TOWN OF HALTON HILLS
28 TOWN OF MILTON
29 TOWN OF OAKVILLE
30 CITY OF BURLINGTON
31 TWP. OF FLAMBOROUGH
32 TOWN OF DUNDAS
33 TOWN OF ANCASTER
34 TOWN OF GLANBROOK
35 TOWN OF STONEY CREEK
36 CITY OF HAMILTON
1 TORONTO
2 EAST YORK
3 YORK
4 ETOBICOKE
5 NORTH YORK
6 SCARBOROUGH
10 TOWN OF PICKERING
11 TOWN OF AJAX
12 TOWN OF WHITBY
13 CITY OF OSHAWA
14 TOWN OF NEWCASTLE
N
Regional Linkages
Municipal Linkages

FIGURE (20).2

GO AREA PARATRANSIT SERVICES & CROSS BOUNDARY LINKAGES.

(20).3 ASSUMPTIONS

Assumptions are broken into four categories as follows:

- o operations
- o equipment
- o demand
- o costs

(20).3.1 Operations

Conventional vehicle purchases are primarily driven by free market forces, that is, if the economics indicates a profit can be made, then a service will likely be provided. Capital costs for these purchases are accounted for in the fare charged to the user (as are administrative, operating costs and profits). Since accessible vehicles are specialized (although they can be used for non-disabled passengers) and are more costly, this option will include the acquisition of these as a separate capital cost to the service.

Although vehicle operators are not committed exclusively to dealing with disabled people, they must be provided adequate training. It is assumed that all vehicle operators will have training equivalent to what is currently being provided to drivers of paratransit vehicles. Attendant policy will also be the same as that of paratransit, that is, attendants will be eligible to use the service. The proportion of trips made by an attendant on existing paratransit is less than 4% . Other than attendant trips, it is assumed that all trips are single passenger trips (ie. passenger-trips equal vehicle-trips).

The administrative/management activities will have limited hours of service, which is assumed to be 6:00 a.m. to 10:00 p.m. However, eligible users are not restricted to these "office hours" to be able to use the subsidized service; as long as a vehicle is available with one of the designated carriers, the eligible user can act independent of the dispatching system after hours. This is to provide a level of service that is comparable to that provided the general population (ie. door-to-door taxi at all times).

(20).3.2 Equipment

As described earlier, most equipment will not be owned by the system but, instead, by the providers of the service. All of the initial cost of accessible vehicle purchases will be provided to the provider as an incentive, but it will be maintained, operated and owned by the private company (50% MTC, 50% Municipality/Region). Office space would be rented, and office equipment either rented or purchased.

(20).3.3 Demand

The catchment population is based on the populations of the municipalities that have GO Transit service (bus or rail) using 1981 populations from Stats Canada. Metro Toronto is excluded from the population for two reasons: first, with regards to inter-regional travel, most trips are to Metro from the surrounding regions; second, Wheel-Trans serves all municipalities within Metro, eliminating any immediate need for a new service within the region. The only need may occur for trips to the airport, and the few whose trips take them outside Metro Toronto[39].

In estimating demand, only trips that cross paratransit boundaries (ie. trips that usually require transfers when travelling by paratransit) are of concern. It is assumed that, generally, service is adequate for local trips using existing means; at least local service is currently better than non-local service (which may, in some cases, be non-existent). As a result, no local trips will be allowed on the system.

It is also assumed that all existing non-local trips using taxi and special transit will be incorporated into the new service. Further, new and diverted trips are based on observations in the U.S. [28] for a new subsidized taxi service; it is assumed that these incidence rates can be applied to the GO catchment area.

When the distribution of total trips among the various linkages is estimated from reference [28]; from reference [20], and from population density and distance of the linkage.

(20).3.4 Costs

As eluded to earlier in this working paper, emphasis of this option will be on a free market environment, where the service provided (to a certain degree) will be dependent on a profit-oriented system. As will be demonstrated later, taxi and limousine service, which is based on such a system, tends to combine the best of both worlds; under certain circumstances it is more economic than the other modes, and it definitely provides a superior level of service to the others. In addition, if driven by market forces, it would be demand responsive (additional vehicles would be added when deemed profitable) and it would absolve the coordinated system's need to carry the burden of a large infrastructure with its associated costs and complexities.

Current taxi fares average $0.90 per kilometre (1986); a premium of 10% is assumed for an accessible taxi or limousine to account for the additional effort required to load and unload the passenger, resulting in a cost of $1.00 per kilometre. With an assumption of one passenger per trip for taxis, the cost kilometre is the same as the cost per passenger=kilometre. Operating costs for paratransit tend to average $1.77 (1986) per vehicle-kilometre (see Table (20).1). This increases cost by about $0.20 per kilometre. Unless the number of passengers per vehicle-trip averages better than 1.97 for all paratransit trips, accessible taxi is still more economic (less than 2.2 passengers per vehicle-trip for special transit would still make conventional taxi more economic). When the high quality of service afforded by taxi is considered, passengers per vehicle-trip for special transit would need to be increased further for this mode to be considered competitive, an unlikely occurrence. However, paratransit will still be an important part of the system for the first five years as more accessible taxis are purchased.

Capital costs are minimal, with start-up costs consisting of accessible taxis (five year life), and office equipment (once only).

---

[39] Of the trips made by the general public, about 10% are in the reverse direction to the peak flow.

The fare would be based on equivalent GO fare plus two feeder trips per system trip; at $1.50 per feeder trip (public transit) this would mean that the fare would start at $3.00, but not exceed this plus the equivalent GO fare. Average GO fare is about $2.00 per passenger trip (1986) or about $0.95 per kilometre.

Other costs would include items such as telephone calls (a toll free number would be provided for those outside the local exchange of the dispatch office), rental accommodation, wages, training and promotion. These are all described in Section (20).5.

(20).4 DEMAND RESULTS

(20).4.1 Eligibility

The eligibility criteria is defined as those who are unable to use public transit, and is estimated from CHDS as those who are in Group B who have trouble using public transit. This represents 1.21% of the catchment; if those who slip through the eligibility screening are included, the incidence increases to 1.52%. It is noted that many paratransit authorities already extend eligibility to these groups (see Table (20).1). This incidence is applied to the catchment population (1,742,000) to get the target population (see Table (20).2).

(20).4.2 Target Population

The target estimate is about 26,900 individuals for the GO catchment (1981), 29,100 (1986).

(20).4.3 Ridership

Ridership is estimated by applying observed incidence [20] of cross boundary trip making to the target population. As described in the approach section, this value represents all non-local trips made by **all** modes. The incidence is 0.076 trips per day per target, or 2044 daily trips for all of GO. Since Metro Toronto was excluded from the catchment, but their residents do contribute to the number of inter-jurisdictional trips (estimated at 10%), they are added to the total at this point in the calculations. Thus, the total is 2249 non-local trips per day on all modes.

Existing trips are assumed to be all current trips made on special transit and taxi. This is estimated to be 6.2% of all non-local trips or 139 trips (see Table (20).2). New and diverted trips are estimated from actual U.S. experience [28], and are in terms of a percentage increase of current non-local trips (all modes). From Table (20).2, this accounts for 11.5% additional trips (8.6% and 2.9% trips for new and diverted trips, respectively). This results in 258 more daily one way trips, for a total estimated demand on the new service of 397 daily non-local trips (average

TABLE (20).2: DEMAND FOR INTER-JURISDICTIONAL SERVICE

A) Catchment: 1,742,000 (1981) from Table D2
1,770,000 (1983)

B) Target - Group B who cannot use P.T. = 1.52% (from CHDS)
0.0152 X 1,742,000 = **26,900**

C) Incidence of Non-Local Trips (all modes) = 7.6% (from DelCan)
0.076 X 26,900 = 2,044 trip/day
+ 10% for outbound trips
2,249

D) Existing Non-Local Trips (taxi or paratransit)

Taxi
- 27% of target use taxi (from CHDS)
- 0.23 trips/day by taxi by those who use taxi (from UMTA)
= 5.2% of all trips[1] (0.23/1.2[2] X 0.27)

Paratransit
- 1.8% of target use special transit (from CHDS - Canada)
- 0.65 trips/day by S.T. by those who use S.T. (from UMTA)
= 1% of all trips[3] (0.65/1.2[2] X 0.018)

Total existing trips = .062 X 2,214 = **137**

E) New and Diverted Trips (from TRB)

	Auto Avail.	Auto Not Avail.	Normalized
% of Target (from CHDS)	69%	31%	100%
% increase in New	2.2%	23%	8.6%
% increase in Diverted	0.8%	7.6%	2.9%

New Trips = 0.086 X 2214 = **193** trips/day
Diverted Trips = 0.029 X 2214 = **65** trips/day

F) Total = **397** trips/day (1983)
= **430** trips/day (1986)

---

1. TRB est. trips by taxi at 1.8% of all trips; UMTA est. at 2 - 7% of all trips.
2. TRB est. trip incidence (all trips, all modes, moderately T.H.) at 1.2 trips/day.
3. UMTA est. trips by S.T. at 1% of all trips.
4. Recorded intermunicipal paratransit trips in GO area is 1400 trips/yr (4 trips/day).

day) or 157,000 trips per year (assuming trips are made 365 days per year and adjusted to 1986 demands by a factor of 1.083).[40]

Total ridership is distributed among the major cross-boundary links so that costs can be calculated. Inter-regional trips account for 57% of all non-local trips and are distributed among the regions as shown in Table (20).3. The remaining trips are distributed among the municipalities using actual data (when available), population densities, distance and judgement. The results are shown in Table (20).4.

(20).4.4 Vehicle Requirements

Average distance travelled per trip is 30 km. Assuming an average speed of 50 km/hour, 70% dead-heading, and 15 minutes for loading and unloading, the estimated time per trip is 75 minutes. Most privately operated taxis run on two eight-hour shifts, which translates into 13 non-local trips per day per taxi. With one passenger per taxi-trip, 33 additional taxis would be required (assuming existing taxis run at capacity) to satisfy the demand. Of these, about one third would be accessible, assuming that the non-ambulatory travel with the same frequency as the balance of the group.

---

[40] As corroboration of this figure, from NCHRP, new door-to-door service would attract 10-15% of the target population, and each of these would make about 60 trips per year. This translates to about 600 trips per day, higher than our estimated since this includes local trips.

TABLE (20).3: INTER-REGIONAL TRIPS

No. of Boundary Crossings	Linkages (Regional)	Average Distance (km)	% of Inter-[1] Regional Trips (%)	Demand[2] (daily one-way trips)
1	Halton & Hamilton	25	12	29
1	Peel & Halton	35	10	25
1	York & Peel	45	5	12
1	Metro & Peel	36	28	69
1	Metro & York	40	20	49
1	Metro & Durham	48	14	34
2	Metro & Halton	60	6	15
3	Metro & Hamilton	85	5	12
TOTAL			100	246

Notes:

(1) Based on figures from [28]; Metro to/from Hamilton estimated.

(2) Inter-regional trips are assumed to be approximately 57% of total non-local trips from Ref. 14.

(3) Totals may not add exactly due to round-off.

TABLE (20).4: INTER-MUNICIPAL TRIPS

No. of Boundary Crossings	Linkages (Municipal)	Average Distance (km)	% of Inter-Municipal Trips (%)	Demand (daily one-way trips)
HALTON REGION				
1	Halton Hills & Milton	21	9.5[2]	18
1	Milton & Oakville	23	6.5	12
1	Burlington & Oakville	16	18.0	33
Population 254,000				
	REGION TOTAL		34[1]	63
DURHAM REGION				
2	Oshawa & Pick/Ajax	20	4.0[3]	7
1	Newcastle & Oshawa	22	11.0	20
1	Oshawa & Whitby	8	14.0	26
1	Whitby & Pick/Ajax	11	6.0	11
Population 288,000				
	REGION TOTAL		35.[1]	64
YORK REGION				
1	Vaughn & Rich'd Hl	10	7.0[3]	13
1	Rich'd Hl & Markham	15	11.0	20
1	Stouffville & Markham	16	4.0	7
1	Aurora & Rich'd Hl	8	5.0	9
2	Newmarket & Rich'd Hl	21	4.0	7
Population 266,000				
	REGION TOTAL		31.0[1]	57
TOTAL			100	184

Notes:

(1) Region totals based proportionately on populations.

(2) Based on figures from Ref.[20].

(3) Based on population density and average distance.

(4) Totals may not add exactly due to round-off.

(20).4.5 "SANITY" CHECK DEMAND FOR DOOR-TO-DOOR INTER-JURISDICTIONAL SERVICE

- Cities offering Door-to-Door service achieve 10% - 15% participation rate, and an uptake of 60 trips per participant per year.*
- Applied to GO area:

Catchment Popl'n (1983)		1,770,000
Percent Unable to Use P.T.	*	1.52%
Target Popl'n (1983)	=	26,900
Target Popl'n (1986)		29,000
Participation Rate	*	10 - 15%
No. of Participants	=	2,900 - 4,300
Annual Trips/Participants	*	60
Total Annual Trips Served	=	174,000 - 258,000

- Our analysis shows 155,000 trips per year. (The lower number is due to the limitation of only non-local trips allowed on the inter-jurisdictional service.)

---

* Source: CBO

(20).5 COST RESULTS

Costs are grouped into capital, variable and other costs for this option.

(20).5.1 CAPITAL COSTS

Capital costs will include one-time office equipment purchases of about $30,000, and the outlay for the purchase of accessible taxis; initially, 11 accessible taxis are required at a cost of $25,000 each; the capital cost to the system for these vehicles is $275,000 spread over five years, or $55,000 per year. Since the life of an accessible cab is expected to be five years, this capital cost is incurred for every year of the 30-year period.

(20).5.2 VARIABLE COSTS

Variable costs are in terms of cost per passenger-kilometre, and simply vary according to demand and distance travelled. Initially some trips are made on paratransit, but over time more are made by the privately purchased accessible taxis. The variable costs for each linkage are accumulated to arrive at a total annual variable cost of $5.3 million, decreasing to a steady state of $4.4 million as paratransit is replaced by the more economic accessible taxi.

(20).5.3 OTHER COSTS

Other costs include items such as telephone charges, office accommodation (which includes office equipment), dispatcher wages, training and promotion. Table (20).5 identifies the approximate costs associated with each of these items. Total annual cost is estimated at $4.6 million at steady state (achieved after 5 years). Average cost is $4.73 million over the costing period.

(20).5.4 COST SUMMARY

Present value costs are calculated for the 30 year period assume a discount factor of ten percent. As shown in Table (20).6, the net total costs for the 30 year period are $39.5 million, or about $24 per trip. Annual net costs (1986) are about $3.8 million, with the provincial share being half of total costs, or $2.5 million. Assuming a 5% increase in costs per year and a 20% increase in demand over the next ten year period, the 1996 estimate of annual net costs is $7.4 million, the provincial share being $4.9 million. Net costs are calculated based on a trip fare of $3.00 (two feeder trips at $1.50 each) plus $0.095 per kilometre (calculated from GO statistics).

TABLE (20).5: OTHER COSTS

Total Trips/yr	157,320
Telephone Cost/trip	$0.38
Telephone Cost/yr	$29,900
Office Rental/yr	$20,000
Hourly Wage	$11
Total Hours/yr	5,456
Total Wages/yr	$60,000
Training/yr	$5,000
Promotion/yr	$5,000
TOTAL OTHER COSTS	**$119,900**

TABLE (20).6: INTER-JURISDICTIONAL SPECIAL SERVICE TOTAL COST

YEAR	CAPITAL COSTS (000s)	VARIABLE (000s)	OTHER (000s)	TOTAL (000s)	NET TOTAL (000s)
1	85	5262	120	5467	4542
2	55	4910	120	5085	4160
3	55	4735	120	4910	3985
4	55	4559	120	4734	3809
5	55	4383	120	4558	3633
6	55	4383	120	4558	3633
7	55	4383	120	4558	3633
8	55	4383	120	4558	3633
9	55	4383	120	4558	3633
10	55	4383	120	4558	3633
11	55	4383	120	4558	3633
12	55	4383	120	4558	3633
13	55	4383	120	4558	3633
14	55	4383	120	4558	3633
15	55	4383	120	4558	3633
16	55	4383	120	4558	3633
17	55	4383	120	4558	3633
18	55	4383	120	4558	3633
19	55	4383	120	4558	3633
20	55	4383	120	4558	3633
21	55	4383	120	4558	3633
22	55	4383	120	4558	3633
23	55	4383	120	4558	3633
24	55	4383	120	4558	3633
25	55	4383	120	4558	3633
26	55	4383	120	4558	3633
27	55	4383	120	4558	3633
28	55	4383	120	4558	3633
29	55	4383	120	4558	3633
30	55	4383	120	4558	3633
NPV	600	47231	1243	49075	39483

ESTIMATED ANNUAL DEMAND (000s)	157.32	
AVERAGE ANNUAL COST OVER 30 YEARS (000s)	4733	3808
NPV OF DEMAND OVER 30 YEARS (000s)	1631.3	1631.3
TOTAL COST/TRIP (NPV TOTAL COST/NPV DEMAND)	30.08	24.20

(20).6 INTANGIBLE COSTS AND BENEFITS

Intangible costs and benefits can occur under various guises, the main ones being: risk, service (level and quality), compatibility (with MTC mandate and operationally), safety and acceptability (including human rights implications).

Risk

The coordinated system needs to be organized in such a way so as to encourage and facilitate private free-enterprise involvement in the system. Sufficient contracts need to be placed and strategically located to ensure a reasonable operating region for the operator so that he may make a profit while not compromising service to the user. The system should make every attempt to reduce vehicle dead-heading, especially for longer trips. Without providing the incentive for private operators to provide such a service, a very serious risk of poor service or significant unmet demand can render this option useless.

If the option can be made to be demand responsive, then very little risk is associated with uncertainties in demand. Since costs are associated predominately with use, cost effectiveness should not vary greatly according to demand (although **total cost** can have a large variation). With cost per trip at approximately $30, it is a very cost-effective option.

Service

The level of service is high for several reasons:

- it provides door-to-door cross boundary service with no transfers;
- it establishes limits on the maximum allowable travel time for trips of various lengths;
- it standardises eligibility for all members of the target group for cross boundary trips;
- the brokerage system arranges the trip for the user.

In addition, the quality of service is quite high; limousines and taxis usually provide more space and superior comfort to that of vans or buses. With fewer or no in-transit stops, the trip is more enjoyable and much quicker than would be possible by other public modes. Appropriately trained operators offer a high level of service to all passengers, including those who are unable to transfer from their wheelchair.

Compatibility

Most of the region is already served by paratransit (some already offer some cross-boundary trip making, see Table 1), and all areas are accessed by limousine or taxi; the infrastructure is already in place, but is currently not coordinated and managed to be of significant use to the target group. It will require negotiation and good management to pool these resources, but little interference with the existing system, operationally, is expected.

Paratransit services are currently operated by the municipality (or town) and subsidised by MTC. The coordination of these and similar services to provide cross boundary service is consistent with MTC's mandate, although this option would extend its responsibility significantly.

Safety

With appropriate operator training a prerequisite, operational and personal safety should not be a issue.

Acceptability

There should be little conflict with existing services, especially GO Transit services. Problems may occur on two fronts, both related to the high level of service: first, the arguments from the non-disabled that the service is superior to conventional public transit; second, sentiments from the disabled community that non-local service is better than local service. (This second argument would not apply if this option is pursued in parallel with the urban taxi incentives proposed elsewhere in the Main Report.)

OPTION (21) FULLY ACCESSIBLE GO BUS SERVICE

OPTION (22) ON-CALL ACCESSIBLE GO BUS SERVICE

(21)(22).1 DESCRIPTION

(21)(22).1.1 TECHNOLOGICAL CONCEPT

This option considers the use of lift-equipped intercity buses, similar to the Accessobus (currently produced by Motor Coach Industries of Winnipeg), in the GO Bus System. Such buses employ an integrated hydraulic lift which can be used to raise wheelchair-bound or other disabled travellers into the bus. The buses carry two wheelchair passengers, with the displacement of eight regular seats. No regular seat loss is incurred if there are no disabled passengers on-board. The lift works in most environments (i.e. in all seasons, in remote locations, etc.). It takes approximately one minute to board or deboard a passenger.

An alternative technical concept is the station-based lift. However, such a device is not considered further for several reasons:

- the concept is not yet fully developed commercially;
- a recent socio-economic study [17] shows the concept to be more expensive than bus-based lifts, in most cases;
- the level and quality of service is lower than in the bus-lift case; (physical transfers are required, making it difficult or impossible for at least 30% of the wheelchair-bound population); and
- the station-based lift would not allow the same flexibility as the lift-equipped bus in terms of location and number of stops (i.e. lift-equipped bus can load/unload almost anywhere).

(21)(22).1.2 OPERATIONAL CONCEPT

As mentioned above, the lift can be operated reasonably quickly, in most environmental conditions. There will be some delays in schedule depending upon the demand, and such changes in level of service are accounted for in the cost analysis. The GO bus service is much more flexible than the train service: at present, variations in schedule can occur due to differing road/traffic conditions. Extra buses are quickly called into service as dictated by demand, with the aid of radio communication between drivers, helping to correct unscheduled delays.

This study assumes some level of upgrade of terminal buildings and bus stops (i.e. this is a total cost analysis). Curb-cuts, accessible washrooms, parking, etc. are required for an accessible system. Some proportion of such costs must be allocated to this option[41]. Many of GO's major stops are in terminals owned and/or operated by others, or in conjunction with others. In such cases, costs are assumed to be shared with other carriers (who provide other services).

Three approaches have been assumed: full accessibility (all buses in the system made accessible, over time), partial accessibility (some buses made accessible, but available to all routes on a reduced frequency), and on-call (buses dispatched where needed according to the existing schedule).

Transfers to and from bus stops are included in the total cost analysis.

(21)(22).1.3 DISCUSSION OF ROUTES

The GO Bus System is a mixture of various types of services, levels of service and overlapping routes. There are ten main routes of the GO bus service, although various feeder routes (train meets) and branch routes would increase this to 20.

Three categories of routes have been developed for this option. They are high demand (five routes), medium demand (two routes) and low demand (three routes). They have been characterized as such to help establish reasonable service levels for the partially accessible systems in order to determine vehicle requirements.

(21)(22).2 APPROACH

(21)(22).2.1 DEMAND

The catchment areas for each GO Bus route have been determined based on analysis of the 1985 GO Bus and Rail Survey TARMS zones distributions. The current ridership is from the GO Corporate Statistics of February 1987. (All values are normalized to 1986).

The target population for this option is Group A, "those who have trouble boarding public transit."[42] . The estimated number in this group is derived as shown in Figure (21)(22).1. The incidence of this group for Ontario is assumed to apply equally to the target for the bus catchment area.

Trips are calculated from the target to produce three values:

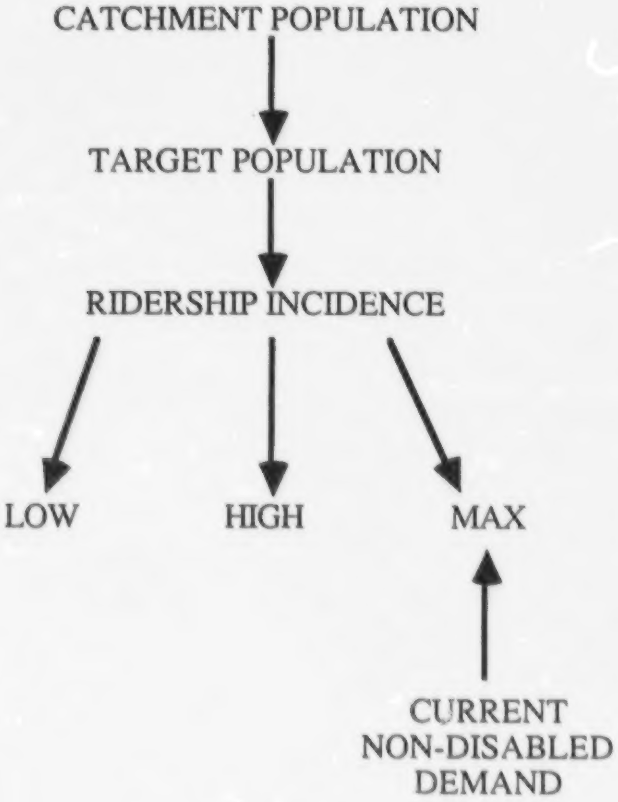
(i) low;
(ii) high;
(iii) maximum.

---

[41] Some of the terminal modifications may be undertaken irregardless of a decision by GO/MTC on the procurement of accessible buses. Differentiation as to the initial motivation for undertaking the modifications is not considered here, ie. some of the costs for modifications are assumed to be allocated to this option.

[42] As a corroboration of this approach, the percentage of those having trouble boarding public transit is very similar to the percentage of those having trouble boarding intercity buses.

FIGURE (21)(22).1: APPROACH


CATCHMENT POPULATION
TARGET POPULATION
RIDERSHIP INCIDENCE
LOW
HIGH
MAX
CURRENT NON-DISABLED DEMAND

The methodology for calculating these values is similar to that used in the Transport Canada Commuter Rail Study [18], with adjustments to reflect updated catchment populations, current ridership and target group definition.[43]

The "low" to "high" range is the likely near-term demand range. The "maximum" value would be a long term maximum, as it is based on "gap analysis", or a takeup rate on the part of the disabled target group equivalent to the current able-bodied takeup (i.e. a barrier-free society). Incidence of existing trips on GO Bus service is applied to the target to estimate this maximum. From this, the low and high demand values are estimated.

Costing and operational details are based on the likely demand, i.e. the low-high range.

(21)(22).2.2 COSTS

Costs are developed for all three scenarios. Capital expenditures are spread over time (the period depending on the equipment). A 30-year study life is assumed, and total costs are present-valued to 1986 dollars.

In order to judge the budgetary implications of making Go Bus services accessible, one-time capital costs and the recurring operating and maintenance costs associated with the various investments need to be shown separately in constant dollars. This is because bus access and access to other fixed-route options are characterized by high one-time capital expenses and relatively lower operating costs whereas door-to-door specialized service displays the opposite profile -- low "start-up" costs with relatively higher operating costs. However, in order to make valid comparisons between alternatives with such disparate life-cycle cost profiles, it is also necessary to compare the present value of their combined capital and operating costs over the full economic lives of the investments.

The results are presented to reflect both total (economic) trip costs associated with this option, and the budgetary characteristics of the option. The costs of feeder service (transfers to and from stations) are included.

The issue of who assumes the cost is not addressed directly. For example some costs may be paid in users' fares, others by MTC subsidy, etc.

---

[43] Note that this approach has been clearly corroborated using the Delcan/Halton Interregional Study [20].

(21)(22).3 ASSUMPTIONS

Assumptions can be grouped into the following four categories:

- operations
- equipment
- demand
- costs

The major assumptions are summarized below. Assumptions are driven to a large extent by the need to develop a system with a comparable level of service to existing non-disabled users of P.T.

(21)(22).3.1 OPERATIONS

- For the partially accessible option, the number of accessible buses integrated into existing routes (and the overall fleet) is determined by service frequency.
- The driver of the accessible bus operates the lift.
- Dwell times at intermediate stops are increased by one minute per lift-user, but is not assumed to have an impact on overall schedule.
- There are no restrictions on remote drop-offs. Transfers to other routes are not considered.
- There is no change in existing attendant policies.
- No space is lost when the lift is unused.
- Transfers to and from the station are included.
- Additional buses are called upon for overload when available.

(21)(22).3.2 EQUIPMENT

- The lift technology is based on the Accessobus. Modifications would be required due to the different environment the lift would be functioning in (commuter vs intercity)
- Jump seats would be put into place on accessible buses so no seats would be lost when not in use by a wheelchair passenger.

(21)(22).3.3 DEMAND

- The target population includes Group A individuals who have trouble boarding public transit.
- Daily trips are one way weekday visits; to calculate total ridership annual trips multiply by 330 (assume 1/3 fewer trips on weekends). To bring figures to 1986 figures, multiply by 1.0832.
- Demand for the partially accessible and on-call systems is 10% less than for the fully accessible option due to the lower level of service. Demand for all options is assumed to be 100% beginning in the first year, although in many cases equipment purchases are staggered over several years.
- There is a loss of existing ridership due to reduced levels of service to the general public (i.e., extended schedules to accommodate loading/unloading time).

(21)(22).3.4 COSTS

- The buses are purchased (not retrofitted)[44], at an additional incremental cost of $25k - $40k. This assumes that the carrier would be purchasing new buses in any case and that the present cost of the accessible bus will lower as orders increase. The total cost of the bus is not included except in the case where additional buses are needed due to lost capacity. The assumed life of the bus and the lift is 15 years. (Initial purchases are staggered.)
- Development costs for the lift technology are not included.
- There is no increase in the overall bus operating and maintenance costs. (O&M costs for the lift are calculated separately; there is an operating cost assumed for the lift.)
- Equivalent fares are charged to lift-users.
- Extra insurance is not required. (Present coverage is assumed adequate.)
- There will be displaced passengers for one third of the runs (peak periods). Four seats are lost for each wheelchair passenger, one seat for others.
- 50% of the GO Terminals are co-owned/operated with other carriers, and modifications to these terminals would be split 50%.
- Terminal upgrades are considered, including accessible washrooms.
- A 30 year economic period is assumed for the present value analysis using a ten percent discount rate.

---

[44] Note that the cost of retrofitting these lifts is similar to the $25-40K quoted.

(21)(22).4 DEMAND RESULTS

(21)(22).4.1 OVERALL RESULTS

The results of the demand estimates are shown in Table (21)(22).1.[45] In comparing these demand values to the current number of runs per day on each route, there would appear to be no need to make all buses accessible in order to meet demand. However, in order to provide comparable level of service, some may argue the all buses should be accessible.

The estimated GO target for this option (that is, those who would potentially benefit) is 4,000 people (.52% of the catchment population) based on a bus LOS catchment of 763,000 people (from [23]).

(21)(22).4.2 FULL ACCESSIBILITY

The likely range of demand for an accessible GO bus system is 26 to 49 trips per day calculated by the methodology of Section (21)(22).3.1. If full service is an option, all buses (totalling approximately 190-200) would be made accessible. The level of service is comparable to the service provided for all GO Bus users. Note that on 94-98% of the runs, the bus-lifts will not be used. As corroboration for this demand level, CBO estimates boardings per lift-equipped bus per day (for a full accessibility system) to average 0.2, or 38 to 40 per day.

(21)(22).4.3 PARTIAL ACCESSIBILITY

The demand for the partially accessible system is assumed to be 10% less than that for the fully accessible system due to the poorer level of service (lower frequency of service; see Table (21)(22).2 in section (21)(22).5).[46] The resulting demand is 24 to 45 one way trips per day.

(21)(22).4.4 ON-CALL SYSTEM

The demand will also be lower for the on-call system even though the accessible trip is made when required (within existing schedules). This is due to the need to reserve an accessible bus for the trip. Again, the reduction in demand is assumed to be approximately 10%, producing the same demand results as that of the partially accessible system.

---

[45] All "trips" and "runs" are defined as one-way; i.e. values refer to the total of all daily trips or runs. To determine inbound or outbound trips or runs, divide the values by two.

[46] Analysis of latent demand studies in the U.S. (ref 84) show that the changes in demand due to changes in LOS are in the order of 4 to 20%.

SUMMARY OF ANNUAL ONE WAY TRIPS
(000s)

	LOW	HIGH	AVERAGE
Full Accessibility	8.85	16.78	12.8
Partial Accessibility	8.10	15.28	11.7
On-Call	8.10	15.28	11.7

(21)(22).4.5. "SANITY" CHECK DEMAND FOR ACCESSIBLE GO BUS SERVICE

- Cities offering lift-equipped bus service average 0.2 boardings per lift-equipped bus.*

- GO Transit full accessibility bus service (200 buses) equates to:

  200 X 0.2 X 330 (Average days)

  = 13,200 Trips per Year.

- GO Transit on-call bus service assumes 10% reduction in demand:

  = 11,900 Trips per Year.

- Our analysis shows 13,500 and 12,200 trips per year, respectively.

---

* Source: National Cooperative Highway Research Program

TABLE (21)(22).1: ACCESSIBLE GO BUS SERVICE: ESTIMATES OF DEMAND & DAILY RUNS

ROUTE	TOTAL CATCHMENT POP'N (1)	DISABLED TARGET POPL'N	CURRENT NON-DISABLED DEMAND (2)	WEEKDAY RIDERSHIP		
				LOW DEMAND	HIGH DEMAND	MAX DEMAND
			TRIPS/DAY	---- TRIPS/DAY ----		
Lakeshore West	205,000	1,079	2,160	1.6	3.0	11.4
Hamilton Express (3)	76,000	400	2,950	2.2	4.1	15.5
Meadowvale/Milton	46,000	242	540	0.4	0.8	2.8
Guelph/G'town/Brampton	108,000	569	4,570	3.4	6.4	24.1
Richmond Hill	62,000	326	6,880	5.1	9.6	36.2
Newm'kt/Barrie/Sutton	68,000	358	5,110	3.8	7.1	26.9
Finch/Bayview	27,000	142	2,160	1.6	3.0	11.4
Stouffville/Uxbridge	73,000	384	4,380	3.2	6.1	23.1
Oshawa	102,000	537	5,110	3.8	7.1	26.9
Bowmanville	8,000	42	340	0.3	0.5	1.8
TOTAL FULL ACCESSIBILE	763,000	4,018	35,370	26.0	49.3	186.2
TOTAL PART ACCESSIBILE	763,000	4,018	35,370	23.7	44.8	169.3
TOTAL ON-CALL SYSTEM	763,000	4,018	35,370	23.7	44.8	169.3

NOTES:

(1) Catchment area defined from 1985 Survey results, egress, using 1981 Population totals, projected to 1986 totals. See attached lists. Total catchments are not straight additions of individual route values due to overlap in catchment areas.

(2) Ridership for bus, taken from 1985 GO Bus Survey, performed in April 1985; for train from the 1985 GO Rail Survey, performed in November 1985; for total GO, from CUTA Ridership trends. All values updated to 1986, using the ratio of total GO riderships, 1986 to 1985.

(3) The catchment area for the Hamilton Express is assumed to be the Hamilton and Burlington end of the route only. If Toronto is added, the catchment area becomes 1,233,000 and the % ridership 0.1

(4) Average trips/month per passenger travelling: Rail 39.7 trips/month

(21)(22).5 COST RESULTS

5.1 COST ITEMS

Capital Costs:
- accessible bus purchases;
- additional bus purchases (for displaced passengers);
- terminal modifications;
- stop modifications;
- reservation system (for on-call system).

Operating & Maintenance Costs:
- operation of lifts (wages);
- maintenance of lifts;
- O & M of additional buses;
- lost ridership (due to schedule changes);
- training;
- information dissemination;
- maintenance of terminal equipment.

Feeder Costs: Two times number of trips

(21)(22).5.2 CAPITAL COSTS

(21)(22).5.2.1 Accessible Vehicles:

Assume lift purchases cost $25K to $40K each in addition to the cost of a typical interurban bus (the cost is comparable to the Accessobus lift cost). Assume also that their life span is 15 years. (only the cost of the lift is included in the calculations)

Full Accessibility: All vehicles accessible -- 200 over 15 years or 13.3 per year.

Partial Accessibility: Number of vehicles is dependent on service frequency. Frequency on existing routes varies according to time of day and demand on route. Assume two periods: peak and non-peak; three levels of demand: low, medium, and high. Table (21)(22).2 shows the calculations in determining vehicle requirements.

The total number of buses required with lifts is 32. A 10% spare stock increases the total to 35.

Purchases of the 35 lift equipped buses are spread over seven years, or five purchases per year.

On-call System: The number of buses required depends on demand during peak period and the fact that, among the non-disabled, 90% of the trips are return trips. Thus, to ensure the availability of a bus for each passenger, the number of buses should equal the **inbound** demand plus 10%, resulting in 13 to 24 accessible vehicles. This would define a maximum number.

Purchases are spread over six years, or 2.2 to 4 lift purchases per year.

TABLE (21)(22).2: PARTIAL ACCESSIBILITY NUMBER OF ACCESSIBLE RUNS AND BUSES

	High Demand Route	Medium Demand Route	Low Demand Route	All Routes
ROUTE NAMES	Hamilton Ex. Richm'd Hill Oshawa Brampton Bayview	Lakeshore W. Barrie/Suton	Uxbridge Milton	
PEAK RUNS				
Frequency of Access. Runs	1 hour	1-1/2 hours	2 hours	---
# Access Runs/Route	8 runs	6 runs	4 runs	---
OFF-PEAK RUNS				
Frequency of Access. Runs	2 hours	3 hours	4 hours	---
# Access. Runs/Route	6 runs	4 runs	3 runs	---
total # access. runs per route	14 runs	10 runs	7 runs	---
# Accessible Buses Required per /route[1]	4	3	2	---
# Routes	5	2	3	10
Total # Accessible Runs/Day	70	20	21	111
TOTAL # BUSES REQUIRED	20	6	6	32

(1) assumes average cycle time to be four hours.

(21)(22).5.2.2 Additional Vehicles:

Additional vehicles purchased cost $240K each, and have an assumed life span of 15 years. All bus purchases are therefore made in years 1 and 16.

Full Accessibility: Of the 26 to 49 trips made per day, approximately 50% will be made in wheelchairs (about 50% of the target are wheelchair users who are assumed to travel with the same frequency as the rest of the group). Buses are generally at capacity during the morning and evening rush hour periods. Assuming that 60% of the target travel during these two two-hour periods (and 90% of the trips are return trips), then about 8 to 15 trips are made during each of these periods. With half of the trips consuming four passenger seats, 20 to 38 additional seats would be required for the new disabled passengers in this option.

Seats would also be lost due to the poorer level of service to the general public. From [29] for every 1% delay in schedule there is a 0.3 - 0.6% loss in ridership. Assuming a 5% to 11% delay in overall schedule, and with 35,370 total trips per day, 5 to 23 trips would be lost due to schedule delays.

Taking the difference in such a way as to generate the widest range (since the two calculations have no correlation) results in a net seat requirement of -3 to 33 seats, or 0 to 1 additional buses, purchased in years 1 and 16.

Partial Accessibility: The problem here is that each accessible trip must have at least four spare seats available (whether or not they are needed). Assuming non-peak accessible trips have sufficient capacity for a wheelchair passenger, but all peak period accessible trips are full, then:

64 peak period accessible trips/day (see Table (21)(22).2)
* 4 seats reserved per trip
= 256 seats during peak periods
or 128 seats per peak (morning and evening)
or 5 additional buses, purchased in years 1 and 16.

On-call System: The effect this option has on total vehicle requirements is almost identical to the fully accessible option with the exception that there is 10% less demand. The effect on the number of buses required, therefore, is not changed. Bus purchases are made in years 1 and 16.

(21)(22).5.2.3 Terminal and Stop Modifications, and Reservation System

Terminal Modifications

There are 32 bus terminals in the GO bus system, plus 5 which serve both Bus and Rail. Each of these stations must be upgraded for full accessibility, as itemized below with the estimated cost per station.

Parking markings, signs, illumination		$ 3,000
Walkways, handrails, non-slip surfaces		10,000
Building access, ramps, auto doors		29,000
Ticket facilities, signs counters		5,000
Washrooms, fountains		18,000
Loading areas, door modes, shelters	+	25,000
Total costs/terminal	=	90,000/terminal
Engineering & contingencies (15%)	+	14,000
	=	104,000
Total number of terminals	x	37
Shared terminals (see Note[47])	x	75%
		$2,890,000

It is assumed that these costs will be spread over the first 15 years (or 2.5 terminals per year), giving an annual capital cost of $195K for all scenarios.

Stop Modifications

Each of the 150 GO Bus stops is assumed to require some modification with respect to curbs, non-slip surfaces, shelters, benches, etc. The total costs per stop are estimated at $3,000. Over 15 years, this equates to $30K/year. This cost is equivalent over all scenarios.

Reservation System

The capital cost of reservation system facilities and equipment is estimated at $10K, expended in years 1 and 16. Note that this option applies to the on-call system only.

---

[47] Approximately 50% of the GO bus terminals are jointly owned/operated with other carriers. It is assumed that (at least some time over the 30-year study life), the other carriers will be taking similar action to make their systems accessible, and thus GO would pay only 50% of the upgrade costs, thus reducing the total costs by 25%.

TABLE (21)(22).3: CAPITAL COST SUMMARY

	Cost	Full Accessibility		Partial Accessibility		On-Call	
Item	Character	Low	High	Low	High	Low	High
Lifts	Life (Yrs)	15	15	15	15	15	15
	Total Units	200	200	35	35	13	24
	Unit Cost ($000s)	25	40	25	40	25	40
	Period (Yrs)	15	15	7	7	6	6
	Unit Increase/Yr	13.3	13.3	5	5	2.2	4
	Cost/Yr ($000s)	332.5	532	125	200	55	160
	Years	1-30	1-30	1-7 16-22	1-7 16-22	1-6 16-21	1-6 16-21
Terminals	Life(Yrs)	>30	>30	>30	>30	>30	>30
	Total Units	37	37	37	37	37	37
	Unit cost ($000s)	78	78	78	78	78	78
	Period (Yrs)	15	15	15	15	15	15
	Unit Increase/Yr	2.5	2.5	2.5	2.5	2.5	2.5
	Cost/Yr ($000s)	195	195	195	195	195	195
	Years	1-15	1-15	1-15	1-15	1-15	1-15
Stops	Life (Yrs)	>30	>30	>30	>30	>30	>30
	Total Units	150	150	150	150	150	150
	Unit Costs ($000)	3	3	3	3	3	3
	Period (Yrs)	15	15	15	15	15	15
	Unit Increase/Yr	10	10	10	10	10	10
	Cost/Yr ($000s)	30	30	30	30	30	30
	Years	1-15	1-15	1-15	1-15	1-15	1-15
Add'n Buses	Life (Yrs)	15	15	15	15	15	15
	Total Units	0	1	5	5	0	1
	Unit Cost ($000s)	240	240	240	240	240	240
	Period (Yrs)	1	1	1	1	1	1
	Unit Increase/Yr	0	1	5	5	0	1
	Cost/Yr ($000s)	0	240	1200	1200	0	240
	Years	-	1,16	1,16	1,16	-	1,16
Reservation System (On-call)	Life	-	-	-	-	>30	>30
	Cost/Yr	-	-	-	-	10	10
	Years	-	-	-	-	1	1

(21)(22).5.3 OPERATING AND MAINTENANCE COSTS

(21)(22).5.3.1 Lifts

It is assumed that the operator of the vehicle will also operate the lift. To calculate the additional person-hours required to operate the lift, it is estimated that unloading at bus stops and terminals takes one minute per passenger, and that loading takes five minutes at terminals (due to congestion--the need to jockey buses or preboarding) and one minute at stops. Assuming the trips are equally split between terminals and stops, the loading and unloading averages four minutes per passenger trip (avg. of 3 min. to board, 1 min. to get off). Operator wages average $20 an hour.

Full Accessibility: 26 to 49 trips per day translates to 572 to 1078 hours of lift operations per year, or $11,440 to $21,560. Although the lifts would be utilized infrequently (among the 200), maintenance costs are estimated at $500 per lift per year. The lift purchases are staggered over 15 years, and so maintenance costs would increase to $100,000 per year by the 15th year.

Partial Accessibility: With 10% fewer trips, lift operation costs are expected to be 10% lower, or $10,400 to $19,600 per year. Furthermore, with 17% of the number of lifts of the full accessibility option, unit maintenance costs are expected to be higher because of higher utilization; this is estimated at $750 per lift per year. These costs would increase to $26,250 per year by the 7th year.

On-Call System: Lift operating costs are expected to be the same for this system as it is for the partial accessible system. Since demand drives this system, lift utilization is highest and so unit maintenance costs are also assumed to be highest at $1,000 per lift per year. Total lift maintenance costs will increase over the first six years until the full complement of lifts are in the fleet.

(21)(22).5.3.2 Additional Buses

Maintenance costs for the additional buses are $26,000 per bus per year. Operator's wages are calculated as follows:

bus operates for 14 hours per day
@$20/hour/operator
@ 330 average days/year
$92,400/bus for operation

Total O&M, therefore, is $118,400 per bus per year for all scenarios.

(21)(22).5.3.3 Terminal Equipment, Stops and Reservation System

All terminal and stop O&M costs are equivalent for each scenario. The reservation cost is applied to the on-call system only.

Terminal Equipment: The automatic doors, washrooms, heated ramps, etc., will require some maintenance, and will be shared among other carriers using the terminals. the maintenance for GO's portion is assumed to be $1,000/year/terminal.

Stops: The 150 GO Bus stops will require minor maintenance and snow removal. These costs are expected to be $500 per stop per year.

Reservation System: Office space and handling reservations are the immediate operating cost components of this system. Although many trips will be subscription trips and customer contact for each trip is not required, dispatching and scheduling of the vehicle is still required. Two shifts are required to cover all hours of operation, thus salaries account for $40,000 to $60,000 of the annual operating expense. Office rental and equipment maintenance will cost about $11,000 to $15,000 per year. Thus total reservation system O&M is $41,000 to $75,000 per year for the on-call system.

(21)(22).5.3.4 Training and Promotion

The high cost of accessibility to GO Bus service will not provide a strong motivation for GO Transit to advertise and disseminate information about the new service. However, for public relations and other reasons, some information dissemination should be assumed. Schedule updates, contacts with user groups, pamphlets etc. will increase awareness of the service. These costs are estimated to be $5,000 per year for labour and materials for all scenarios.

Full Accessibility: Drivers, mechanics and terminal staff would all require training on the operation and maintenance of the new equipment. Training would include the cost of lost wages, trainers and materials. This is estimated to cost $28,000 per year.

Partial Accessibility: Due to the reduced service and number of buses, the training component is assumed to be 25% of the full accessible costs, or $7,000 per year.

On-call: Same costs as the partial accessible system.

(21)(22).5.4 FEEDER COSTS

Unit feeder costs are calculated in the specially-routed fixed-route option and are utilized in this option. These are costs normalized over all possible feeder modes, including walking. The high cost estimate includes the cost of expanding the paratransit service for increased demand due to this new accessible service. The costs are $5.14 to $7.38 per feeder trip, or double this per accessible bus trip. Annual feeder costs for this new service are:

OPTION	LOW	HIGH
Full Accessibility	$91,000	$248,000
Partial Accessibility	$83,000	$225,000
On-Call System	$83,000	$225,000

TABLE (21)(22).4: ANNUAL O&M AND FEEDER COST SUMMARY

Item	Cost Character	Full Accessibility		Partial Accessibility		On-Call	
		Low	High	Low	High	Low	High
Lift Ops	Total Cost ($000s)	11.4	21.6	10.4	19.6	10.4	19.6
	Steady Cost ($000s)	11.4	21.6	10.4	19.6	10.4	19.6
Lift Maint.	Unit Cost ($000s)	0.5	0.5	0.75	0.75	1	1
	Unit Increase/Yr.	13.3	13.3	5	5	2.2	4
	Inc Cost/Yr ($000s)	6.7	6.7	3.75	3.75	2.2	4
	Years Increasing	15	15	7	7	6	6
	Steady Cost ($000s)	100	100	26.25	26.25	13	24
Stations	Unit Cost ($000s)	1	1	1	1	1	1
	Unit Increase/Yr.	10	10	10	10	10	10
	Inc Cost/Yr ($000s)	5	5	5	5	5	5
	Years Increasing	15	15	15	15	15	15
	Steady Cost ($000s)	37	37	37	37	37	37
Stops	Unit Cost ($000s)	0.5	0.5	0.5	0.5	0.5	0.5
	Unit Increase/Yr.	10	10	10	10	10	10
	Inc Cost/Yr ($000s)	5	5	5	5	5	5
	Years Increasing	15	15	15	15	15	15
	Steady Cost ($000s)	75	75	75	75	75	75
Add'n Buses	Unit Cost ($000s)	--	118.4	118.4	118.4	--	118.4
	Unit Increase/Yr.	0	1	5	5	0	1
	Inc Cost/Yr ($000s)	--	118.4	592	592	--	118.4
	Years Increasing	--	1	1	1	--	1
	Steady Cost ($000s)	0	118.4	592	592	0	118.4
Reserv-ation	Unit Cost ($000s)	-	-	-	-	41	75
	Steady Cost ($000s)	-	-	-	-	41	75
Other -Training -Promotion	Unit Cost ($000s)	33	33	12	12	12	12
	Steady Cost ($000s)	33	33	12	12	12	12
Feeder	Unit Cost/Trip	10.28	14.76	10.28	14.76	10.28	14.76
	Total Trips/Yr.	8,850	16,780	8,100	15,280	8,100	15,280
	Total Cost ($000s)	91.0	247.6	83.3	225.5	83.3	225.5

(21)(22).5.5 TOTAL COSTS AND UNIT COSTS

Total 30 year present value costs and year-to-year budgetary costs for the full accessibility, partial accessibility and on-call scenarios are presented in Tables (21)(22).5, (21)(22).6, and (21)(22).7, respectively. Annual, total, and unit costs are summarized for the three scenarios below:

SUMMARY OF ANNUAL TOTAL COSTS
(000s)

OPTION	LOW	HIGH	AVERAGE	NET AVERAGE
Full Accessibility	$ 763	$1,276	$1,020	$ 960
Partial Accessibility	1,182	1,381	1,282	1,230
On-Call	430	831	630	570

SUMMARY OF TOTAL 30 YEAR COSTS - PRESENT VALUE
(000s)

OPTION	LOW	HIGH	AVERAGE	NET AVERAGE
Full Accessibility	$ 7,910	$13,230	$10,570	$ 9,940
Partial Accessibility	12,250	14,320	13,290	12,760
On-Call	4,460	8,620	6,540	5,950

SUMMARY OF UNIT COSTS

OPTION	LOW	HIGH	AVERAGE
Full Accessibility	$76	$ 86	$ 81
Partial Accessibility	90	146	118
On-Call	53	54	54

Net average costs are total costs less revenue from fares.

Assuming an average fare per trip of $5.00 ($3.00 for two feeder trips plus $2.00 for equivelent GO fare), the percentage of revenue to total costs (using unit costs) for the full, partial and on-call options are 6%, 4% and 9%, respectively.

The provincial share of the net total costs is 100% for these GO options.

Assuming 5% inflation per year for the next ten years, the estimated 1996 annual budget (excluding fares) is $1.6 million for the full accessibility option; this assumes, that while population will increase, the system has sufficient excess capacity to accommodate any increase in demand over this time period. However, for the partial accessibility and on-call options demand will affect service requirements since no excess capacity exists. Assuming a 20% growth in demand over the next ten years, in addition to inflation, the estimated 1996 annual budget (excluding fares) is $2.4 million and $1.1 million for the partial accessibility and on-call options, respectively.

TABLE (21)(22).5 FULLY ACCESSIBLE GO BUS OPTION: COSTS

YEAR	CAPITAL		OPERATING & MAINTENANCE		FEEDER		TOTAL	
	LOW	HIGH	LOW	HIGH	LOW	HIGH	LOW	HIGH
1	$558	$997	$59	$187	$91	$248	$707	$1,432
2	$558	$757	$73	$201	$91	$248	$722	$1,206
3	$558	$757	$87	$216	$91	$248	$736	$1,220
4	$558	$757	$101	$230	$91	$248	$750	$1,234
5	$558	$757	$115	$244	$91	$248	$764	$1,249
6	$558	$757	$130	$258	$91	$248	$778	$1,263
7	$558	$757	$144	$272	$91	$248	$793	$1,277
8	$558	$757	$158	$287	$91	$248	$807	$1,291
9	$558	$757	$172	$301	$91	$248	$821	$1,305
10	$558	$757	$186	$315	$91	$248	$835	$1,320
11	$558	$757	$201	$329	$91	$248	$849	$1,334
12	$558	$757	$215	$343	$91	$248	$864	$1,348
13	$558	$757	$229	$358	$91	$248	$878	$1,362
14	$558	$757	$243	$372	$91	$248	$892	$1,376
15	$558	$757	$257	$386	$91	$248	$906	$1,391
16	$333	$772	$257	$386	$91	$248	$681	$1,406
17	$333	$532	$257	$386	$91	$248	$681	$1,166
18	$333	$532	$257	$386	$91	$248	$681	$1,166
19	$333	$532	$257	$386	$91	$248	$681	$1,166
20	$333	$532	$257	$386	$91	$248	$681	$1,166
21	$333	$532	$257	$386	$91	$248	$681	$1,166
22	$333	$532	$257	$386	$91	$248	$681	$1,166
23	$333	$532	$257	$386	$91	$248	$681	$1,166
24	$333	$532	$257	$386	$91	$248	$681	$1,166
25	$333	$532	$257	$386	$91	$248	$681	$1,166
26	$333	$532	$257	$386	$91	$248	$681	$1,166
27	$333	$532	$257	$386	$91	$248	$681	$1,166
28	$333	$532	$257	$386	$91	$248	$681	$1,166
29	$333	$532	$257	$386	$91	$248	$681	$1,166
30	$333	$532	$257	$386	$91	$248	$681	$1,166
PV	$5,330	$7,697	$1,633	$2,967	$946	$2,567	$7,910	$13,231

AVERAGE ANNUAL COST (000s)	$763	$1,276
AVERAGE ANNUAL DEMAND (000s) *	8.85	16.78
30 YEAR PV OF DEMAND (000s)	91.75	173.97
COST/TRIP	$86	$76

* Accounts for one third less travel on weekends (Ref. 3).

All figures adjusted to 1986

TABLE (21)(22).6 PARTIALLY ACCESSIBLE GO BUS OPTION: COSTS

YEAR	CAPITAL		OPERATING & MAINTENANCE		FEEDER		TOTAL	
	LOW	HIGH	LOW	HIGH	LOW	HIGH	LOW	HIGH
1	$1,550	$1,625	$626	$635	$83	$225	$2,259	$2,485
2	$350	$425	$637	$646	$83	$225	$1,070	$1,296
3	$350	$425	$648	$657	$83	$225	$1,081	$1,307
4	$350	$425	$659	$669	$83	$225	$1,092	$1,319
5	$350	$425	$671	$680	$83	$225	$1,104	$1,330
6	$350	$425	$682	$691	$83	$225	$1,115	$1,341
7	$350	$425	$693	$702	$83	$225	$1,126	$1,352
8	$225	$225	$701	$710	$83	$225	$1,009	$1,160
9	$225	$225	$708	$717	$83	$225	$1,016	$1,167
10	$225	$225	$716	$725	$83	$225	$1,024	$1,175
11	$225	$225	$723	$732	$83	$225	$1,031	$1,182
12	$225	$225	$731	$740	$83	$225	$1,039	$1,190
13	$225	$225	$738	$747	$83	$225	$1,046	$1,197
14	$225	$225	$746	$755	$83	$225	$1,054	$1,205
15	$225	$225	$753	$762	$83	$225	$1,061	$1,212
16	$1,325	$1,400	$753	$762	$83	$225	$2,161	$2,387
17	$125	$200	$753	$762	$83	$225	$961	$1,187
18	$125	$200	$753	$762	$83	$225	$961	$1,187
19	$125	$200	$753	$762	$83	$225	$961	$1,187
20	$125	$200	$753	$762	$83	$225	$961	$1,187
21	$125	$200	$753	$762	$83	$225	$961	$1,187
22	$125	$200	$753	$762	$83	$225	$961	$1,187
23	$0	$0	$753	$762	$83	$225	$836	$987
24	$0	$0	$753	$762	$83	$225	$836	$987
25	$0	$0	$753	$762	$83	$225	$836	$987
26	$0	$0	$753	$762	$83	$225	$836	$987
27	$0	$0	$753	$762	$83	$225	$836	$987
28	$0	$0	$753	$762	$83	$225	$836	$987
29	$0	$0	$753	$762	$83	$225	$836	$987
30	$0	$0	$753	$762	$83	$225	$836	$987
PV	$4,199	$4,697	$7,195	$7,290	$860	$2,333	$12,254	$14,321

	LOW	HIGH
AVERAGE ANNUAL COST (000s)	$1,182	$1,381
AVERAGE ANNUAL DEMAND (000s) *	8.10	15.28
30 YEAR PV OF DEMAND (000s)	83.98	158.44
COST/TRIP	$146	$90

* Accounts for one third less travel on weekends (Ref. 3)

All figures adjusted to 1986

TABLE (21)(22).7 ON-CALL ACCESSIBLE GO BUS OPTION: COSTS

YEAR	CAPITAL		OPERATING & MAINTENANCE		FEEDER		TOTAL	
	LOW	HIGH	LOW	HIGH	LOW	HIGH	LOW	HIGH
1	$290	$635	$73	$237	$83	$225	$446	$1,097
2	$280	$385	$83	$248	$83	$225	$446	$858
3	$280	$385	$93	$260	$83	$225	$455	$870
4	$280	$385	$102	$271	$83	$225	$465	$881
5	$280	$385	$112	$283	$83	$225	$475	$893
6	$280	$385	$122	$294	$83	$225	$485	$904
7	$225	$225	$129	$302	$83	$225	$437	$752
8	$225	$225	$137	$309	$83	$225	$445	$759
9	$225	$225	$144	$317	$83	$225	$452	$767
10	$225	$225	$152	$324	$83	$225	$460	$774
11	$225	$225	$159	$332	$83	$225	$467	$782
12	$225	$225	$167	$339	$83	$225	$475	$789
13	$225	$225	$174	$347	$83	$225	$482	$797
14	$225	$225	$182	$354	$83	$225	$490	$804
15	$225	$225	$189	$362	$83	$225	$497	$812
16	$55	$400	$189	$362	$83	$225	$327	$987
17	$55	$160	$189	$362	$83	$225	$327	$747
18	$55	$160	$189	$362	$83	$225	$327	$747
19	$55	$160	$189	$362	$83	$225	$327	$747
20	$55	$160	$189	$362	$83	$225	$327	$747
21	$55	$160	$189	$362	$83	$225	$327	$747
22	$0	$0	$189	$362	$83	$225	$272	$587
23	$0	$0	$189	$362	$83	$225	$272	$587
24	$0	$0	$189	$362	$83	$225	$272	$587
25	$0	$0	$189	$362	$83	$225	$272	$587
26	$0	$0	$189	$362	$83	$225	$272	$587
27	$0	$0	$189	$362	$83	$225	$272	$587
28	$0	$0	$189	$362	$83	$225	$272	$587
29	$0	$0	$189	$362	$83	$225	$272	$587
30	$0	$0	$189	$362	$83	$225	$272	$587
PV	$2,219	$3,140	$1,384	$3,148	$860	$2,333	$4,463	$8,621

AVERAGE ANNUAL COST (000s)	$430	$831
AVERAGE ANNUAL DEMAND (000s) *	8.10	15.28
30 YEAR PV OF DEMAND (000s)	83.98	158.44
COST/TRIP	$53	$54

* Accounts for one third less travel on weekends (Ref. 3)

All figures adjusted to 1986

(21)(22).6 INTANGIBLE COSTS AND BENEFITS

Many aspects of the accessible bus issue cannot be quantified. Some attempt has been made in this study to address these questions in an objective manner. To be specific, intangible costs and benefits generally reflect a positive or negative assessment of several different criteria including: groups included or excluded, peripheral groups who may benefit,; quality of service (physical and mental comfort, independence, dignity, etc.); compatibility with existing systems; development risk (control of cost, development time frame, industry inertia, technical feasibility, etc.); and integration[48]

(21)(22).6.1 OPERATIONAL RISK

Operationally, the system has some risk:

- it assumes the driver will operate the lift; this may well be beyond the contract terms of the bus operator and may be operationally infeasible;
- congestion at terminals may preclude the possibility of lift operation;
- road-side boarding may be difficult, and particularly susceptible to inclement weather conditions, especially winter operation; snow removal can be a major logistical burden, and cold whether can play havoc on exposed equipment;
- although not quite as high as in the accessible rail situation, operational risk does exits; mechanical failures are always possible and can produce numerous problems, including the perception of an unreliable service.
- if demand is higher than initially estimated, there is the risk of under capacity and unsatisfied customers; if demand is over estimated then costs are much higher than necessary (this is particularly the situation in the on-call system).

(21)(22).6.2 OTHER DEVELOPMENT CONSIDERATIONS

Quality of Service: Quality of service is low when compared to other modes such as paratransit or taxi. The lack of control by the disabled passenger in boarding a lift-equipped vehicle, and interference with non-disabled riders are possible sources of discomfort (mental and physical), and although wheelchair users can remain in their chairs, much depends on how GO Transit implements the concept and trains it's operators (as well as educates it's users both disabled and non-disabled).

---

[48] Note that, despite the fact that integration is a real issue, conclusions in this regard are difficult. For example, many disabled travellers in urban area prefer the higher level of service of paratransit that the "ideal" of integrated services on public buses.

Level of Service: For the full accessibility scenario spontaneous travel decisions can be made (provided they can get to the stop/station); frequency and hours of service are comparable to that provided to the general public. For the on-call system, a 24 hour reservation period is required (at most) to guarantee an accessible bus at a particular stop on a particular route. This is generally contrary to GO's operating practice, and is less appealing to the disabled traveller. The partial accessibility scenario does not require a reservation, but is a scheduled accessible service on all routes at reduced frequency. It therefore provides a lower level of service when compared to the full accessibility case.

In any of the scenarios, additional travellers may benefit from the bus-lift (i.e those with marginal or temporary disabilities may take advantage of the lift service).

Development Risk: No development of the technology is required. The proposed technology has been developing since 1984 (through funding by Transport Canada) and successfully tested by CN's Terra Transport in Newfoundland (operating at 8 runs per month). It has been so successful that the Boston Transit Commission has ordered 36 Accessobuses for its commuter service and the San Francisco Transit Commission has ordered twenty-two. Thus, the development time frame is expected to be short.

In an operational context, the concept of an on-call system is not new. WMATA in Washington, D.C. operates a partially integrated public transit service (not all routes, and not all times) in conjunction with an on-call system (24 hour reservation requested). Their experience has been very favorable, although coordination and dedication between service provider, user, and administrator is a necessary condition.

System Compatibility: The success of the accessible GO Bus service depends alot on the state of the feeder service, and how well it (especially paratransit) can be coordinated with GO Bus schedules.

Public Acceptability: Some degradation of service is unavoidable, especially in the beginning. Although this may initially result is lost passenger-trips, it is hoped that public awareness will help to alleviate any problems of public acceptability.

Integration: The accessible GO Bus service provides integration into the mainstream commuter transportation system, however, see note 8 on previous page.

INTER-REGIONAL (GO) OPTIONS

OPTION (23) PARTIALLY ACCESSIBLE GO RAIL SERVICE

(23).1 DESCRIPTION

This option assesses the feasibility of making commuter rail operations in the GO region accessible to disabled persons - in particular wheelchair passengers. The study focuses on the seven commuter rail routes currently operating in the GO area: Lakeshore West, Milton, Stouffville, Lakeshore East, Georgetown, Richmond Hill and Bradford.

This study has assumed that, from an operational point of view, only terminal stations and Union station can be made accessible since the dwell time at intermediate stations is not sufficient to board even one wheelchair passenger (using a car-borne lift). As a result, ridership estimates have been derived using terminal station catchment areas. In calculating these ridership estimates, special emphasis has been given to terminal stations on the Lakeshore West Line and Lakeshore East Line since full service on these routes will soon be extended to include Hamilton and Oshawa respectively, thereby making Oakville and Pickering intermediate stations. The other five terminal stations include Milton, Stouffville, Georgetown, Richmond Hill and Bradford.

A car-borne mechanized lift will be used to transport wheel-chair passengers from the platform to the car (this boarding method is used to reduce the costs and operational problems created by special raised station platforms used in the Transport Canada study [18]. Once on the train car the wheel-chair passenger is secured. Each wheel-chair position results in the removal of four existing seats. The car-borne mechanized lift can board a maximum of three wheel-chair passengers within a six minute dwell-time.

The paratransit system serving the municipality in which the terminal station exists will provide a feeder service. Of course, other modes are available as a feeder service.

(23).2 APPROACH

(23).2.1 DEMAND

The approach used to project ridership levels for the service entails five distinct steps, and is show in Figure (23)1.

Step 1: Determine the catchment area population for each of the seven rail routes.

Step 2: Determine the target population for each of the seven rail routes. The target population includes Group A individuals who have trouble boarding public transit.

Step 3: Determine the total daily disabled ridership.

Step 4: Determine the existing daily general ridership originating at terminal 235 stations.

Step 5: Calculate the target group's ridership levels originating at the terminal stations only (the commuter rail system becomes operationally infeasible if wheelchair travellers board or deboard at intermediate stations). These ridership levels are calculated by using the same ridership levels developed in Step 3, adjusted by the ratio of the existing ridership levels at terminal stations (see Step 4) to ridership levels along the entire route.

The catchment areas for each of the seven GO Rail routes have been determined based on analysis of the 1985 GO Bus and Rail Survey TARMS zones distributions. The current ridership is from the GO Corporate Statistics of February 1987. (All values are normalized to 1986). Since only the seven terminal stations and Union station are made accessible, demand is estimated from the total route catchment (all stations accessible) and adjusted to reflect the percentage of existing rides originating from the terminal stations. Special emphasis has been given to Hamilton and Oshawa as these stations are not currently served by rail; full service will result in higher ridership levels originating from these two areas.

The target population for this option (as developed in other options) is Group A, "those who have trouble boarding public transit."[49] The incidence of this group for Ontario urban is applied to the particular catchment area.

Trips are calculated from the target population to produce three values:

(i) low;
(ii) high;
(iii) maximum.

The methodology for calculating these values is similar to that used in the Transport Canada Commuter Rail Study [18], with adjustments to reflect updated catchment populations, current ridership and target group definition.[50]

The "low" to "high" range is the likely near-term demand range. The "maximum" value would be a long term estimate, based on "gap analysis", or a takeup rate of the disabled target group equivalent to the current able-bodied takeup (i.e. a barrier-free society).

Costing and operational details are based on the likely demand (i.e. the low to high range).

---

[49] As a corroboration of this approach, the percentage of those having trouble boarding public transit is very similar to the percentage of those having trouble boarding intercity buses.

[50] Note that this approach has been clearly corroborated using the Delcan/Halton Interregional Study (Ref. 13).

(23).2.2 COSTS

Capital expenditures are spread over time (the period depending on the equipment). A 30-year study life is assumed, and total costs are present-valued to 1986 dollars.

In order to judge the budgetary implications of making commuter rail systems accessible, one-time capital costs and the recurring operating and maintenance costs associated with the various investments need to be shown separately in constant dollars. This is because commuter rail access and access to other fixed-route options are characterized by high one-time capital expenses and relatively lower operating costs whereas door-to-door specialized service displays the opposite profile -- low "start-up" costs with relatively higher operating costs. However, in order to make valid comparisons between alternatives with such disparate life-cycle cost profiles, it is also necessary to compare the present value of their combined capital and operating costs over the full economic lives of the investments.

The results are presented to reflect both total (economic) trip costs associated with this option, and the budgetary characteristics of the option. The costs of feeder service (transfers to and from stations) are included.

The issue of who assumes the cost is not addressed directly. For example some costs may be paid in users' fares, others by MTC subsidy, etc.

(23).3 ASSUMPTIONS

Assumptions can be grouped into the following four categories:

- operations
- equipment
- demand
- costs

One of the major assumptions used in designing the system was to provide the target with a comparable level of service.

(23).3.1 OPERATIONS

The table below shows the assumptions made regarding station dwell times and the permissible delay for peak and off-peak periods.

STATION DWELL TIME AND PERMISSIBLE DELAY

	Peak		Off-Peak	
	Dwell Time (sec)	Delay Permissible	Dwell Time(sec)	Delay Permissible
Union Station	360	no	360	no
Terminal Stations	600	no	600	no
Intermediate Stations	30-60	no	30-60	no

All terminal stations have ten-minute dwell times. Union station has a six minute dwell-time. Intermediate stations have, at maximum, a one minute dwell time.[51]

The dwell time at intermediate stations is such that not even one wheelchair traveller can board, using a car-borne lift, without incurring some delay in the system (boarding technology is discussed in the next section). Thus the analysis of this option assumes that only the seven terminal stations and Union Station can be made accessible. The dwell time at Union Station, which is shorter in duration than terminal stations, restricts the number of disabled passengers getting on at terminal stations, since all the wheelchair passengers who get on at the terminal station may all get off at Union Station. Therefore, for analytic purposes, the dwell time at terminal stations is assumed to be six minutes rather than ten minutes.

It is assumed that once on the Union Station loading platforms, a wheelchair passenger can access an elevator, which implies either no barriers on the platform from existing stairwells, or assumes the train is able to stop at the appropriate location (i.e. adjacent to an elevator).

Each on-board wheelchair position results in the removal of four existing seats, and thus the question arises of how to accommodate the overflow. Of course, this is only an issue when the trains are at 100% capacity. Adding another car to the existing train is not a feasible alternative due to the length of the platform. It has been assumed that to schedule extra trains to pick up this overflow is not a feasible alternative for two reasons: (i) those overflow trains will not be operating near capacity; and (ii) the difficulty of scheduling additional trains during the already congested peak demand periods. The only alternative available under a "no-seat-loss" policy is to allow these "overflow" persons to stand. However, the disabled persons will be distributed over all cars and over all periods. Therefore, it is assumed there will be no train expansion or lost revenue due to lost seats.

---

[51] Discussion with MTC and GO Transit regarding full service assumptions and permissible dwell times.

It is assumed that paratransit will be used approximately 40% of the time as a feeder service to the accessible rail system. Based on ridership estimates within the terminal station catchment area, it appears that the level of service of existing paratransit within these municipalities will not be jeopardized. However, there is a potential problem at Union Station, which is a destination point for many of the incoming trips from all seven lines. Since Wheel-Trans is already operating at full capacity, more vehicles would likely have to be purchased to handle the extra demand originating at Union Station as a result of an accessible commuter rail system. This extra cost has been included in the high cost analysis.

(23).3.2 EQUIPMENT

The first concern is designing a means for those unable to use steps (especially wheelchair users) to get from the station platform into the rail car. This choice affects the operational feasibility of accessible commuter rail, the required platform and vehicle design modifications, and the associated economics. For this study it was decided that the car-borne mechanized lift was the boarding method which offered the best compromise between operational feasibility and economics.

Car-borne mechanized lifts are in common use on transit buses in a number of U.S. cities -- although a production model has yet to be constructed for commuter rail cars. The lift-platform extends mechanically from above the vehicle steps and comes to rest on the station platform. The passenger then boards the lift-platform and is raised mechanically to the vestibule level.

The car-borne mechanized lift was chosen over the raised mini-platform and bridge plate technology (the mini-platform and bridge plate technology was chosen as the optimal boarding method for the Transport Canada, Commuter Rail Study) because of economic and operational considerations. The mini-platform and bridge plate technology was deemed to create operational problems at Union Station since the platform would compound the congestion which currently exists at the downtown station, although once in place, the bridge plate allows quicker boarding.

For the car-borne mechanized lift, an estimated 125 seconds is required to board the first passenger; additional users require 98 seconds each, according to time and motion studies [22]. Within a six minute dwell time, no more than three complete cycles of the lift can be performed.

To provide a comparable level of service, one car per train would need to be made accessible for the target group. Each accessible car would have two car-borne mechanized lifts, one on each side, in order to provide maximum flexibility at Union Station where any one of 13 tracks can be used to board/deboard.

Each terminal station is equipped with one accessible washroom and two elevators (along with other minor modifications) except Union station, which gets two accessible washrooms and seven elevators.

(23).3.3 DEMAND

The methodology for demand estimates is described in section (23).2.1. Data on the size of the target population and their travel behaviour is limited. Estimates of the target population and their travel behaviour is based on the non-disabled for which information exists, and on the Canadian Health and Disability Survey [2] which has good information for Ontario individuals in the specified target group.

The target population includes Group A individuals who have trouble boarding public transit (0.526% of the catchment). It is assumed these individuals will require the use of the lift to board although not all are wheelchair bound. For this analysis we have assumed 50% of the target group are in wheelchairs.

Daily trips are in terms of one way weekday trips. To obtain total annual trips, multiply the daily figure by 330 (assumes 1/3 fewer trips on weekends). The factor used to bring ridership to 1986 figures (from 1983 figures) is 1.0832.

(23).3.4 COSTS

Costs were derived using the Transport Canada study [18] and also [29]. A 30 year economic period is assumed for the present value analysis. In addition, a ten percent rate of discount is used in the computation of present values. This is the Federal Treasury Board's recommended rate for capital projects.

Costs elements for this option are detailed in section (23).5. Costs that are **not** included are:

- development costs for the lift technology
- increase in overall train O&M costs
- costs for extra insurance (present coverage is assumed adequate)
- accessible washrooms on the train

Equivalent fares are charged to lift-users.

(23).4 DEMAND RESULTS

(23).4.1 TARGET POPULATION

Table 1 identifies the catchment and target populations for each of the seven GO Rail routes as well as a total for the system.

Lakeshore East has the largest Catchment Area population - 801,000 versus Lakeshore West - 663,000 (although Lakeshore West has the highest daily weekday ridership representing over 50% of the entire trips made on the GO system). Almost 80% of the GO Rail catchment lies within the Lakeshore West and Lakeshore East catchment areas.

The estimated GO target for this option is 42.5% of 9,800 or 4,200 people (1986).

(23).4.2 RIDERSHIP

Although Lakeshore East has a higher target population than Lakeshore West (4,220 vs 3,490), ridership levels for Lakeshore West are projected to be almost ten times as high as Lakeshore East (terminal stations accessible only).

In order to determine disabled ridership with only terminal stations accessible, it is necessary to determine the percentage of total boardings occurring at terminal stations. Table 1 summarizes these percentages, which have been calculated assuming that disabled ridership at terminal stations will be in the same proportion as able-bodied ridership at terminal stations.

The number of **inbound** trips is used (as opposed to total daily trips) to assess the operational feasibility of this option. (i.e. Will the demand for any one train exceed the scheduled dwell time?) The estimate of incoming ridership for the total system is 7.9 to 15.2 trips. The maximum incoming daily ridership is 48.4 trips. The ridership figures are low due to the premise that only terminal stations can be made accessible. If all stations were made accessible, then ridership would more than triple, but of course, this would be operationally infeasible as explained earlier.

SUMMARY OF ANNUAL ONE WAY TRIPS

(000s)

LOW	HIGH	AVERAGE
5.4	10.4	7.9

TABLE (23).1: ACCESSIBLE GO RAIL SERVICE: ESTIMATES OF DEMAND & DAILY TRIPS (TERMINAL STATIONS ACCESSIBLE)

Route	Total Catchment Population (1)	Disabled Target Population	Current NonDisabled Demand Trips/Day (2)	% Boarding at Terminal	Weekday Ridership Low Demand	High Demand	(Inbound Trips) Max Demand
					----- Trips per Day ----- (3)		
Lakeshore West	663,000	3,490	30,440	39	5.1	9.8	31.2
Milton	400,000	2,110	5,510	20	0.5	0.9	2.9
Stouffville	180,000	950	1,238	10	0.1	0.1	0.3
Lakeshore East	801,000	4,220	11,350	11	0.5	1.0	3.3
Georgetown	403,000	2,120	6,196	48	1.3	2.5	7.8
Richmond Hill	402,000	2,120	2,460	34	0.4	0.7	2.2
Bradford	62,000	333	930	25	0.1	0.2	0.6
Rail Total	1,860,000	9,790	58,110	42.5	7.9	15.2	48.4

Notes:

(1) Catchment area are defined from 1985 Bus and Rail surveys, using 1981 Statistics Canada population totals, projected to 1986. Total values are not straight additions of the individual route due to overlap in catchment areas.

(2) Ridership values, include 2-way trips and are from October 1986, prorated to the average 1986 weekday values; all from GO Transit Corporate Ridership Statistics, February, 1987.

(3) Trips are inbound trips only; to get total trips, multiply by two. Ridership based on terminal stations accessible only.

(23).5 COST RESULTS

(23).5.1 COST ITEMS

Capital Costs:
- -lift purchases;
- -terminal modifications;

Operating & Maintenance Costs:
- -operation of lifts (wages);
- -maintenance of lifts;
- -maintenance of terminal equipment.
- -training;
- -information dissemination;

Feeder Costs: Two times number of trips

(23).5.2 CAPITAL COSTS

A summary of the capital costs is presented in Table (23).2.

(23).5.2.1 Lifts

- put Car-borne mechanized lifts on all GO Trains, which represents the sum of all inbound trains from the seven terminal stations; there are 60 inbound trains;
- 2 lifts per accessible car @ $53,000 per lift = $6,360,000
- spread initial purchase over 10 years ($636,000/year)
- 15 year life for the lift, therefore lift purchases are made for years 1 to 10, and 16 to 25.

(23).5.2.2 Terminal Modifications

There are seven terminal stations plus Union station.

o	mild grade changes:	- all terminal stations	
		- automatic doors -	$15,000
		- heated ramp -	$ 7,500
		- platform modifications (emerg. exit) -	$15,000
o	washrooms[52]	- one per terminal station, two at Union Station	
		- $15,000 per washroom	

---

[52] No accessible washrooms on train.

- grade changes requiring elevator
  - two elevators needed to provide access to rail platform at terminal stations
  - seven elevators needed at Union Station
  - elevator cost:
    elevator - $60,000
    elevator housing - $60,000
    electrical/mechanics - $30,000
    Total $150,000
- total terminal modification costs (including Union Station) = $3,585,000
- spread over 5 years ($717,000/yr)
- life span beyond the 30 year cost horizon

(23).5.3 OPERATING AND MAINTENANCE COSTS

Annual operating and maintenance costs are summarized in Table (23).2.

Operation of Lifts

- 1 attendant per accessible car
- 2 shifts
- salary per attendant is $30,000
- total annual cost at steady state is $3,600,000

Maintenance of Lifts

- $500/lift/year
- total annual cost at steady state is $60,000

Maintenance of Terminals

- elevators -- $2,400/elevator/year
- other (doors, ramps etc.) -- $500/terminal/year
- total annual cost at steady state is $54,400

Training

- training for attendants, terminal staff and mechanics
- includes cost of lost wages, trainers and materials
- $28,000 per year

Information dissemination

- involves schedule updates, contact with user groups, pamphlets, etc.
- includes labour and materials
- $5,000 per year

(23).5.4 FEEDER COSTS

- low feeder cost -- $5.14/feeder trip
- high feeder cost -- $7.38/feeder trip (includes cost of paratransit expansion)
- total annual feeder cost
  - low cost - $53,600
  - high cost - $148,200

(23).5.5 TOTAL COSTS AND UNIT COSTS

Total and annual budgetary costs are presented in Table (23).3. Cost per trip varies from $332 to $621, averaging $476. Net costs, costs excluding revenue from fares, is assumed to be 99% of total costs ($5/$476 assumming average fare per trip is $5 - see (20)). The provincial share is 100% of this. Therefore, the 1986 budgetary outlay is $3.4 million, which is totally paid for by the province. Present value of net costs over 30 years is $35.1 million. The 1996 estimated budgetary outlay, allowing for 20% growth in demand, and 5% inflation per year, is $6.6 million.

TABLE (23).2: COST SUMMARY

CAPITAL COSTS

Item	Cost Character		
Lifts	Life (Yrs)	15	
	Total Units	120	
	Unit Cost ($000s)	53	
	Period (Yrs)	10	
	Unit Increase/Yr	12	
	Cost/Yr ($000s)	636	
	Years	1-10, 16-25	
		Elevators	Other
Terminal Stations (7 Stations)	Life	>30	>30
	Total Units	14	7
	Unit Cost ($000s)	150	52.5
	Period (Yrs)	5	5
	Unit Increase/Yr	2.8	1.4
	Cost/Yr ($000s)	420	73.5
	Years	1-5	1-5
Union Station	Life	>30	>30
	Total Units	7	1
	Unit Cost ($000s)	150	67.5
	Period (Yrs)	5	5
	Unit Increase/Yr	1.4	0.2
	Cost/Yr ($000s)	210	13.5
	Years	1-5	1-5

ANNUAL O&M COSTS

Lift Ops	Unit Cost ($000s)	30	
	Unit Increase/Yr	12	
	Cost Increase/Yr ($000s)	360	
	Years Increasing	10	
	Steady Cost ($000s)	3600	
Lift Maintenance	Unit Cost ($000s)	0.5	
	Unit Increase/Yr	12	
	Cost Increase/Yr ($000s)	6	
	Years Increasing	10	
	Steady Cost ($000s)	60	
		Elevators	Other
Terminal Maintenance	Unit Cost ($000s)	2.4	0.5
	Unit Increase/Yr	4.2	1.6
	Cost Increase/Yr ($000s)	10.1	0.8
	Years Increasing	5	5
	Steady Cost ($000s)	50.4	4
Other - Training	Unit Cost ($000s)	33	33
- Promotion	Steady Cost ($000s)	33	33
		Low	High
Feeder Cost	Total Trips/Yr	5380	10350
	Unit Cost/Trip ($)	10.28	14.76
	Total Cost ($000s)	55.3	157.8

Table (23).3 Accessible Rail - 30 Year Total Costs

YEAR	CAPITAL (000s)	OPERATING & MAINTENANCE (000s)	FEEDER LOW (000s)	FEEDER HIGH (000s)	TOTAL LOW (000s)	TOTAL HIGH (000s)
1	$1,353	$410	$55	$153	$1,818	$1,916
2	$1,353	$787	$55	$153	$2,195	$2,293
3	$1,353	$1,164	$55	$153	$2,572	$2,669
4	$1,353	$1,541	$55	$153	$2,949	$3,046
5	$1,353	$1,918	$55	$153	$3,326	$3,423
6	$636	$2,284	$55	$153	$2,975	$3,072
7	$636	$2,650	$55	$153	$3,341	$3,438
8	$636	$3,016	$55	$153	$3,707	$3,804
9	$636	$3,382	$55	$153	$4,073	$4,170
10	$636	$3,748	$55	$153	$4,439	$4,536
11	$0	$3,748	$55	$153	$3,803	$3,900
12	$0	$3,748	$55	$153	$3,803	$3,900
13	$0	$3,748	$55	$153	$3,803	$3,900
14	$0	$3,748	$55	$153	$3,803	$3,900
15	$0	$3,748	$55	$153	$3,803	$3,900
16	$636	$3,748	$55	$153	$4,439	$4,536
17	$636	$3,748	$55	$153	$4,439	$4,536
18	$636	$3,748	$55	$153	$4,439	$4,536
19	$636	$3,748	$55	$153	$4,439	$4,536
20	$636	$3,748	$55	$153	$4,439	$4,536
21	$636	$3,748	$55	$153	$4,439	$4,536
22	$636	$3,748	$55	$153	$4,439	$4,536
23	$636	$3,748	$55	$153	$4,439	$4,536
24	$636	$3,748	$55	$153	$4,439	$4,536
25	$636	$3,748	$55	$153	$4,439	$4,536
26	$0	$3,748	$55	$153	$3,803	$3,900
27	$0	$3,748	$55	$153	$3,803	$3,900
28	$0	$3,748	$55	$153	$3,803	$3,900
29	$0	$3,748	$55	$153	$3,803	$3,900
30	$0	$3,748	$55	$153	$3,803	$3,900
PV	$8,318	$25,712	$573	$1,584	$34,603	$35,614

	LOW	HIGH
AVERAGE ANNUAL COST (000s)	$3,337	$3,435
AVERAGE ANNUAL DEMAND (000s) *	5.38	10.35
30 YEAR PV OF DEMAND (000s)	55.75	107.34
COST/TRIP	$621	$332

* Accounts for one third less travel on weekends

All figures adjusted to 1986

(23).6 INTANGIBLE COSTS AND BENEFITS

Many aspects of the accessible rail issue cannot be quantified. Some attempt has been made in this study to address these questions in an objective manner. To be specific, intangible costs and benefits generally reflect a positive or negative assessment of several different criteria including: groups included or excluded, peripheral groups who may benefit; quality of service (physical and mental comfort, independence, dignity, etc.); compatibility with existing systems; development risk (control of costs, development time frame, industry inertia, technical feasibility, etc.) and integration. The accessible rail option has an additional issue that although an element in the other options, is significant here; it is operational risk.

(23).6.1 OPERATIONAL RISK

Special Events - The Case of Exhibition Station: This station, which is within the Canadian National Exhibition grounds, is used only for special events in the off-peak and during the season when the C.N.E. and Ontario Place are open. At the present time, all passengers arrive at or depart the station on foot as there is no interface with any public transportation facilities or road systems. Direct, at-grade access is provided to the south platform, while access to the north platform is via stairs and a walkway over the C.N.R. tracks.

Exhibition station, if made accessible during peak special event periods, is a potential source of operational and scheduling problems if the dwell time is not extended to meet the projected attendance of disabled persons at special events.

With various attractions and recreational events ongoing at Exhibition Stadium and Ontario Place, Exhibition Station could conceivably see considerable weekend demand among disabled persons for accessible commuter rail. Regular hourly service is provided to Exhibition Station, as outlined below:

	Eastbound	Westbound
Weekdays	8:30 a.m. - 11:30 p.m.	8:48 a.m. - 12:48 a.m.
Saturday	8:58 a.m. - 11:58 p.m.	8:48 a.m. - 12:48 a.m.
Sunday	9:58 a.m. - 11:58 p.m.	9:48 a.m. - 12:48 a.m.

There is a variability in the dwell time from 30 seconds to three minutes depending on the crowds. When a three minute dwell-time is not sufficient to deal with the crowds, extra service is provided (by taking trains out of storage) to help diminish over-crowded platforms, standing room only cars and the like. It is very difficult to plan for specific numbers because there are many parameters which affect ridership. For instance, weather conditions, the opening of Ontario Place, extra innings in baseball games, the particular opposing team in sporting events, and a desire to avoid the rush are but a few of the factors which affect peak period demand at Exhibition Station. For the most part it is when the special event is over that the peak occurs with departures for Exhibition Station; arrivals are dispersed over a wider time frame. With the assumption that .526% of the catchment area population is our target group, then the projected disabled ridership for a typical Blue Jays game is 13 trips.[53]

Under current operations two regularly scheduled trains plus two extra-service trains are generally sufficient to meet the crowds. This number of trains, however, will not be sufficient to service 13 disabled trips within the maximum dwell time of three minutes; only one wheelchair passenger can board for each train within this time. Therefore, up to nine additional trains will be necessary to accommodate disabled persons during special event peak periods if dwell time is to be adhered to. This analysis suggests that exhibition station during peak special event periods would be a source of operational and schedule problems should it be made accessible.

Delay at Union Station: The maximum number of disabled persons who can disembark at Union Station, using the car-borne mechanized lift, within a six minute dwell time is three. This six minute dwell time at Union Station is made up of two components: passenger boarding/deboarding time and schedule recovery time. The disembarkment of three wheel-chair passengers leaves practically no time for schedule recovery (39 seconds).

On the Lakeshore West Line, 10% of all trains during the peak demand periods are late by more than three minutes. As a result, at the very least 10% of all trains during the peak periods will not be able to service the likely disabled demand within the current operating schedule.

If a train does not leave on schedule during the peak period, for whatever reason, then scheduling problems and train conflicts will occur. These conflicts may be resolved by rescheduling trains to Union Station during the periods of potential problems. Contractual arrangements with freight, and other passenger carriers may make this impossible to accomplish. A second alternative, although very expensive, is station capacity improvement. However, the construction of an additional track and platform, as well as passenger tunnels to accommodate the overflow must be subjected to further cost-benefit analysis to determine its ultimate feasibility. This is beyond the scope of this study.

Trainman Communication System: Without undertaking a detailed analysis, it is assumed that the existing on-board communication system could be expanded to include communications with attendant (who lowers and raises the mechanical lift, secures all wheelchairs and signals the operator to leave). The cost associated with add-ons to the existing communication system does not appear to be significant and is not included in the costs in this study.

Wheelchair Securement: If the operating authority requires disabled passengers to be seated or their wheelchair to be tied down before the train leaves the station, and if no additional dwell time is available, then the maximum feasible number of wheelchair passengers permitted to board would be reduced to the point which, operationally, the accessibility of commuter rail would likely be infeasible.

---

[53] Ridership levels for weekend and weekday ridership incurred for specific special events provided by GO Transit

Alternative Boarding Method: Using the mini-raised platform with bridge plate technology instead of the car-borne mechanized lift would increase the maximum feasible number of wheelchair boardings at terminal stations from 3 to 15. This alternative boarding technology would appear to solve the potential operational problems which may occur due to high demand at the Hamilton station (ie. more than three wheelchair passengers). However, the mini-raised platform occupies considerable space on the loading platform, creating a problem that becomes particularly evident at Union Station where congestion on the platform during peak periods is considerable; therefore safety is an issue with this alternative boarding method.

(23).6.2 OTHER DEVELOPMENT CONSIDERATIONS

Quality of Service: Quality of service is low when compared to other modes such as paratransit or taxi. A great deal depends on adequate training of attendants, and appropriate operational procedures on boarding and safety.

Levels of Service: The level of service of accessible commuter rail is comparable to that offered to the general public. All commuter trains will be specially equipped and attendants properly trained to deal with the specific needs of the targeted users.

Development Risk: There is always a risk associated with the unknown demand, which has both operational and economic implications that, for this option in particular, can be significant. For instance, if demand is underestimated then there is the possibility that wheelchair users will be denied access due to a lack of capacity and forced to wait for the next train. On the other hand if demand is not large enough to support this system, then from a cost-effectiveness point of view, it becomes extremely expensive.

There is also risk associated with the integrity of the GO rail system, especially if equipment failure occurs. Technologically, the boarding method is unproven in this environment. Prototypes have been built and tested, but not in the context of a commuter rail operation. Furthermore, the car-borne lift has the most devastating effect on operations in case of mechanical break down (when compared with other boarding mechanisms), essentially arresting the train's operation and, possibly affecting other trains as a result.

System Compatibility: The success of the accessible commuter rail system depends largely on how well paratransit operations can coordinate their operation to act as a feeder service.

Public Acceptability: Increased congestion in GO stations will result with implementation of this option. This congestion could lead to an increase in journey time, and thus a decrease in overall ridership. Furthermore, equipment failures could deem this service as unreliable.

Integration: Despite the fact that integration is a real issue, conclusions in this regard are difficult. Although accessible commuter rail service, as described in this option, is integrated, it may not be a preferred option (by the user).

OPTION (24) SPECIALIZED FIXED ROUTE SYSTEM

(24).1 DESCRIPTION

The specially-routed fixed-route system is intended to provide an alternative means of transport of a **comparable** level of service to regular public transit for those who are currently unable to **board** existing conventional transit within the GO service sector. The service will be of most benefit to individuals who wish to make inter-municipal/-regional trips, but find that they have no means, or that the existing systems are too inconvenient (special transit) or costly (taxi or personal vehicle) to the user. The new service is not specifically intended to replace any existing service, but to improve cross-boundary trip making (regional as well as municipal).

There are three variations of this option, each differing on the level of service they provide, but all revolving around the use of a completely separate system from existing public transit; there is no interaction with conventional P.T. The various levels of service examined are as follows:

> **BUS LOS** - Frequency, speed, number of stations, hours of operation are all comparable to existing GO bus service. The routes used, although similar to existing GO routes, are special in that they consider the target's trip purposes when identifying stops; they **do not** contain stops intended to act as transportation hubs. Initially three high density routes are assessed for economic and operational feasibility. Total costs and unit costs are also calculated for the total GO system, comparable on LOS to the existing GO Bus system.
>
> **RAIL LOS** - same as above, except comparable to rail.
>
> **ON - CALL** - A system that is comparable to bus, but has no regular schedule. An accessible bus will be provided on the specified route on an as required basis within an existing timetable. That is, a timetable will indicate when a vehicle can be made available, but a request is required so that the vehicle is dispatched. Subscription is allowed for recurring trips. Again, the system is first assessed on three high density routes, and then expanded to the total system.

This option does assume that feeder service is available to get the target to the transfer points of the system. The feeder modes that are assumed to be available to the target include existing paratransit, private auto, taxi, other agency served modes, and walking. In this sense, it would not be unlike public transit for the general public, with its schedules and "feeder" network to stations along a fixed route. The specially-routed system, however, would have its own schedule (to accommodate travel patterns of the target, longer boarding times, coordination with feeder modes etc.), its own special vehicles, and its own operators specifically trained to deal with the special needs of the target.

System stops may consist of a facility as simple as an accessible building with seating and washroom facilities (an existing bus station or GO station), a shopping centre with accessible facilities, or as elaborate as a "pedestrian precinct" which integrates many of the needs of the disabled under one roof. While the system would utilize, to the extent possible, existing stations that are already accessible, modifications may be required to facilitate the movement, safety and comfort of the users. These could be as minimal as the provision of curb cuts, ramps, seating, shelters and automatic doors at the loading and unloading points. Stops that are pedways or shopping centres would be completely accessible (many new centres already are accessible, and older ones are continually being brought to these standards), and would be a point of departure or arrival for many of the targeted users.

Because of the special routing, the trip pattern would resemble a "many-to-few" arrangement for many of the trips; for trips requiring specialised needs, such as work, school, or medical, a "many-to-many" travel arrangement may still be necessary, which would involve at least two transfers (if the O-D pair is within the same paratransit jurisdiction, then the trip should be a paratransit trip rather than a trip on this system).

Three routes have been initially identified as having the potential level of demand required to justify such a new service. They are: Oakville to Metro Toronto in the west -- 37 km. long, Pickering to Metro Toronto in the east -- 33 km. in length, and a north-and-west route extending to Pearson International Airport and to Brampton from Metro Toronto -- 42 km. in length. A total of 19 different stations would be made accessible along the three routes. The specific stations along each of the routes, and pedways and shopping centres (marked with an *) are listed below:

Route 1 - Oakville GO station
Clarkson Station
Mississauga Square One Shopping Mall *
Kipling Subway Station
Exhibition Station (only for special events)
Royal York Hotel (Union Station) *
Elizabeth Street Station (Bus Terminal)

Route 2 - Pickering GO Station
Sheridan Mall *
Scarborough Town Centre *
Kennedy Subway Station
Elizabeth Street Station (Bus Terminal)
Royal York Hotel (Union Station) *

Route 3 - Royal York Hotel (Union Station) *
Elizabeth Street Station (Bus Terminal)
Yorkmills Subway Station
Yorkdale Shopping Centre *
Pearson International Airport
Bramalea City Centre *
Brampton GO Station

Figure 1 shows the three routes and their associated stations.

Four paratransit systems can provide a feeder service among the three routes: Metro Toronto's Wheel-Trans, Pickering's Handi-Trans, the Peel region paratransit system (Transhelp), and Oakville's Care-A-Van. In all, fifteen paratransit systems serve the GO area (including Guelph and Barrie). In addition, there are numerous special agency services that offer special transit that may also be used as a feeder mode.

The three routes described above would be considered a starting point from which, as demand dictates, other routes could be added. For example, the three routes described all radiate from downtown Toronto; other possible routes may tie in the "spokes", avoiding a trip to the core if, say, a trip from Oakville to Pearson International Airport was requested.

A minimal cost pilot scheme to test the economic and operational viability (and acceptance) of the option could consist of leasing four accessible vans, placing them on one of the three routes, and rotating them over a six to eight week cycle on each route. Only stations that are currently accessible would be used , and each route would be promoted for a period commencing two or three weeks prior to and continue through the testing of the route.

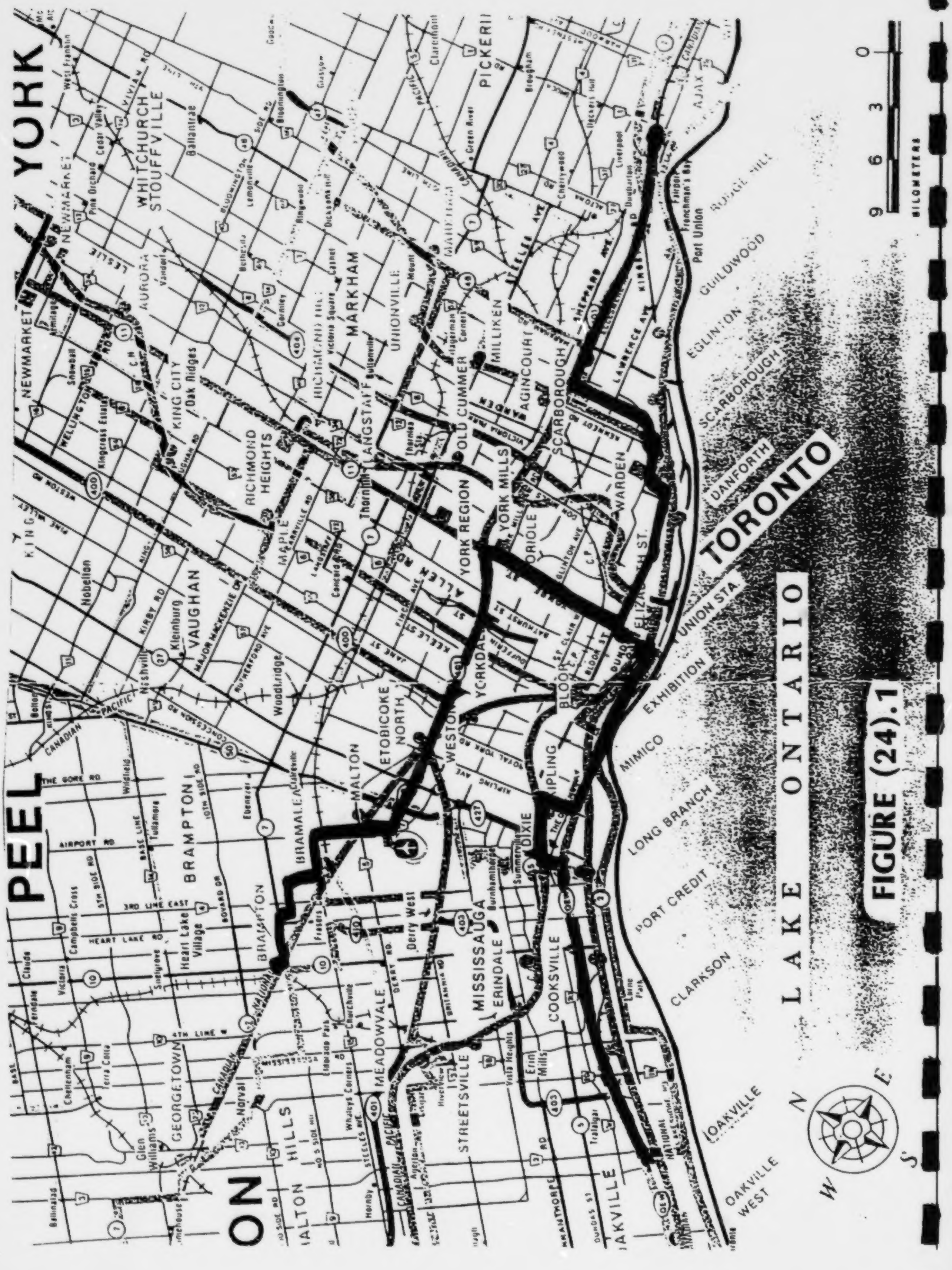

PEEL
YORK
ON
TORONTO
LAKE ONTARIO
NEWMARKET
AURORA
WHITCHURCH STOUFFVILLE
KING
KING CITY /Oak Ridges
RICHMOND HEIGHTS
RICHMOND HILL
MARKHAM
UNIONVILLE
MILLIKEN
AGINCOURT
SCARBOROUGH
PICKERING
AJAX
VAUGHAN
MAPLE
LANGSTAFF
Thornhill
OLD CUMMER
YORK REGION
YORK MILLS
ORIOLE
YORKDALE
WESTON
ETOBICOKE NORTH
MALTON
BRAMALEA
BRAMPTON
GEORGETOWN
Glen Williams
Norval
HALTON HILLS
MEADOWVALE
STREETSVILLE
MISSISSAUGA
ERINDALE
COOKSVILLE
DIXIE
KIPLING
BLOOR
OAKVILLE
OAKVILLE WEST
CLARKSON
PORT CREDIT
LONG BRANCH
MIMICO
EXHIBITION
UNION STA.
DANFORTH
SCARBOROUGH
EGLINTON
GUILDWOOD
Port Union
ROUGE HILL
Frenchman's Bay
WARDEN
KENNEDY
Woodbridge
Kleinburg
Nobleton
Heart Lake Village
Derry West
Vista Heights
Erin Mills
Lorne Park
Ballantrae
Bloomington
Gormley
Victoria Square
Brougham
Green River
Claremont
Cedar Valley
Pine Orchard
Snowball
Kingcross Estates
Bolton
Nashville
Cheltenham
Terra Cotta
Campbells Cross
Tullamore
Churchville
Hornby
Trafalgar
ALLEN RD
STEELES AVE
SHEPPARD AVE
LAWRENCE AVE
KINGSTON RD
EGLINTON AVE
BLOOR ST
DUNDAS ST
KEELE ST
JANE ST
WESTON RD
FINCH AVE
AIRPORT RD
THE GORE RD
HEART LAKE RD
3RD LINE EAST
4TH LINE
CANADIAN PACIFIC
CANADIAN NATIONAL
9 6 3 0
KILOMETERS
N
E
S
W

FIGURE (24).1

(24).2 APPROACH

The two basic components required to assess operational and economic feasibility are demand and costs. A detailed assessment of this option for the three levels of service is performed for the three routes described above. Bus level of service assumes bus catchment and travel incidence, and similarly, rail level of service assumes rail catchment and travel incidence. The analysis is extrapolated to the total GO area for the three levels of service as follows: **to estimate demand,** the catchments for each of the levels of service are obtained from the respective options analyses (accessible bus and accessible rail). The on-call system uses the bus level of service figure less 10% to account for reduced service; **to estimate cost,** bus costs for the three route system are multiplied by a factor of 6.5 for the bus LOS (20 routes in the total system), and by two for the on-call system (costs are related more to demand than to level of service); for the rail LOS, rail costs for the three route system are multiplied by two (seven routes in the total system). The approach is described for the three route system.

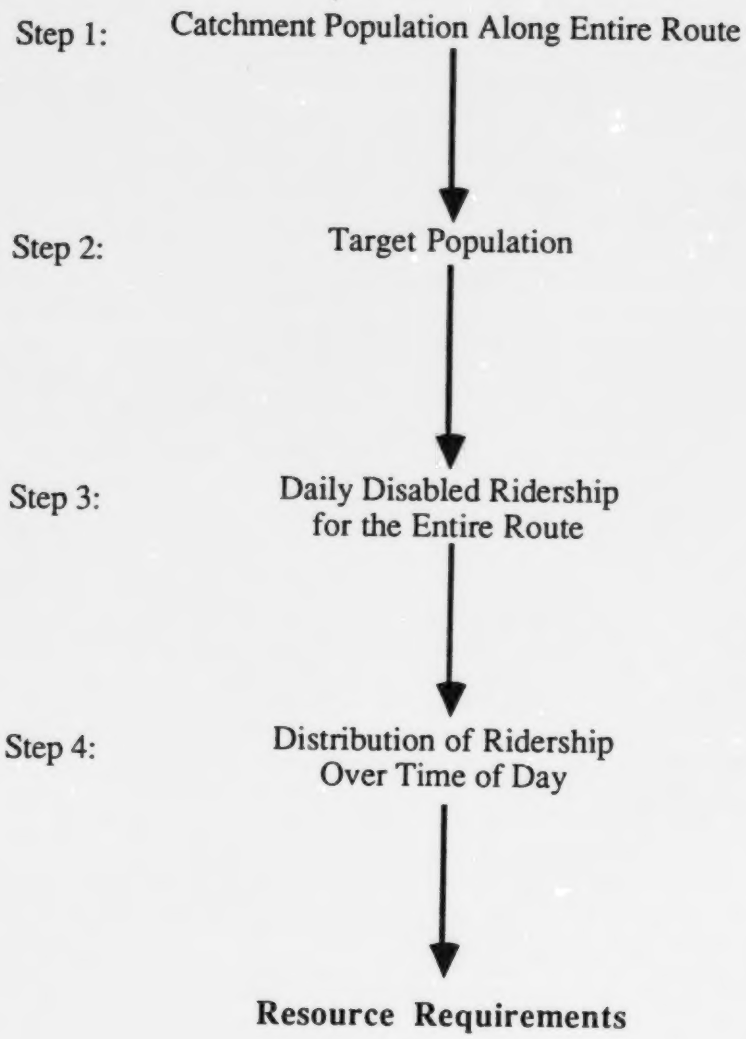
(24).2.1 Demand

The approach used to assess demand for the service entails four distinct steps, with each step hinging on the results of the preceding steps. For this reason, the first step is the most critical and thus requires a great deal of attention. Figure (24).2 shows the structure of the approach.

Step 1: The approach begins with the identification of the general population of the catchments for the three routes. It would be ideal to have direct figures for the target population (potential users) of the routes, but because eligibility varies (depending on the study purpose) and no formal statistics are recorded for detailed districts, this figure must be estimated. Catchment is determined from the 1985 GO Bus and Rail Survey TARM zones distributions; populations are obtained by applying these percentages to Stats Canada Census figures for 1981, adjusted to 1986. Specifically, for Routes 1 and 2, the ridership is predominately from those who reside outside of Metro Toronto who need or wish to travel to Metro. Trips on Route 3 are motivated for two reasons; as above, trips will originate from outside Metro Toronto (Brampton, Bramelea) to serve the various needs of the target; trips will also originate from within Metro to serve Pearson International Airport. Therefore, this route has two catchment areas, depending on the trip purpose.

Step 2: Once the eligibility criteria have been developed, the target population can be estimated from the catchment population figures by applying an incidence of the target that is equivalent to the Ontario incidence. This figure provides a value for the **potential** population, but does not specify the actual (or predicted) usage of the service; for this, incidence rates predicting uptake are required.

FIGURE (24).2: APPROACH


Step 1:
Catchment Population Along Entire Route
Step 2:
Target Population
Step 3:
Daily Disabled Ridership for the Entire Route
Step 4:
Distribution of Ridership Over Time of Day
Resource Requirements

Step 3: A likely range of total daily (week day) ridership is calculated as in the Transport Canada Commuter Rail report [22]; adjustments to these figures are made to reflect updated catchment populations, updated able-bodied ridership and the new target group definition. A different incidence is calculated for Route 3, airport-bound; figures on actual non-disabled (senior citizens) transfers to airports by rail and bus is used to estimate incidence of airport travel by the target.

Step 4: Several travel patterns of the target are used to approximate various trip distributions and, thus, peak travel periods during the day. One travel pattern assumes a distribution similar to that of commuter rail service by the non-disabled; this produces a fairly drastic peak in the distribution. To smooth the peak somewhat (and to better reflect the target's travel behaviour), another method uses the relative proportion of trip purpose among the target population; the assumption here is that work-related trips are normally associated with morning and evening travel times within particular hours; other trip purposes are assumed to be randomly distributed throughout the day. A final pattern assumes trips are distributed equally throughout the service period, an assumption that is not unrealistic, given the nature of the target population. This produces a range of demand during the peak period that has a noticeable, but slight, affect on peak vehicle requirements.

The ridership distribution, along with the frequency of service, dictate the minimum number of vehicles required and the annual vehicle hours.

(24).2.2 Costs

Costs are divided into three categories: capital, operations and maintenance, and the cost of the feeder service. The unit costs for each component are given a low and high value to correspond to the low and high resource scenarios; this produces a low and a high total cost scenario.

In order to judge the budgetary implications of providing such a service, one-time capital costs and the recurring operating and maintenance costs associated with the various investments need to be shown separately in constant dollars. This is because fixed-route options are characterized by high one-time capital expenses and relatively lower recurring costs whereas door-to-door specialized service displays the opposite profile -- low "start-up" costs with relatively higher recurring costs. However, in order to make valid comparisons between alternatives with such disparate life-cycle cost profiles, it is also necessary to compare the present value of their combined capital and operating costs over the full economic lives of the investments.

The results are presented to reflect both total (economic) trip costs associated with this option, and the budgetary characteristics of the option. The costs of feeder service (transfers to and from stations) are included.

The issue of who assumes the cost is not addressed directly. For example some costs may be paid in users' fares, others by MTC subsidy, etc.

(24).3 ASSUMPTIONS

Assumptions are broken down into four categories as follows:

- o operations
- o equipment
- o demand
- o costs

The basic underlying premise or assumption is that the option proposed here is designed to provide a level of service that is comparable to existing public transit services available to the general public.

(24).3.1 OPERATIONS

Since this system depends on existing paratransit as a feeder service, eligibility will need to be coordinated with paratransit authorities, keeping in mind that paratransit eligibility should not be tighter than that of the proposed system. Existing paratransit loosely uses the criteria of "unable to board" public transit as the condition determining eligibility; this is the basis for eligibility for the specially-routed system.

While the new service will replace some (of the cross-boundary) trips currently satisfied by paratransit, it will also generate new trips for paratransit; currently, most cross-boundary trips are served by modes other than paratransit (see Ref. 13, 14, 15), and, therefore, it is the demand for these other modes that will be relieved by the new fixed-route system. It is assumed, in the low cost scenario, that sufficient capacity exists with existing paratransit to pick up the extra trips. The high cost scenario adds a capital cost (in terms of cost per trip) to account for the extra capacity requirement of the feeder service on paratransit.

It will be assumed that drivers will be provided with the same level of training as that being provided to drivers of paratransit vehicles, and that these drivers will operate on the fixed accessible routes only. Attendant policy will also be the same as that of paratransit.

Hours of operation will need to coincide with those of paratransit, or at least not extend beyond existing paratransit operating hours. However, for a comparable service, the service hours should also coincide with that of public transit. It is suggested that the hours extend from 6:00 a.m. to 10:00 p.m., providing access for commuter trips as well as social/recreational trips. The service will operate within a full seven day schedule, with reduced frequency on the weekends.

Frequency of service, depending on the scenario considered, is comparable to either existing commuter rail or bus service. As shown in the results, the effects are significant; frequency affects vehicle requirements and operating costs as well as demand for the service.

Route trip length is assumed to be made of two components: the actual driving time, and boarding time. Actual driving time, which does not include idle time, is based on distance travelled and assumes an average speed of 40 kph in the peak direction, and 50 kph in the non-peak direction. An additional five minutes is added to the driving time for each stop along the route. This is to account for the time to get to the stop entrance doors and back to the main road. Boarding time is separated into two as well: those who are confined to a wheelchair, and the ambulatory. Boarding time utilizing conventional lifts assumes four minutes for the first passenger, and three and a half minutes for subsequent passengers. The ambulatory, and those using ramps require a half minute boarding time. While it is possible to load ambulatory passengers at the same time the lift is being utilized, it is assumed here that all passengers board concurrently. This will produce a more conservative estimate for boarding time. As the worst case, it is assumed that the loading is distributed evenly among all stations, and that all passengers disembark at the final station on the route. Loading and unloading times are assumed to be equivalent.

(24).3.2 EQUIPMENT

The equipment and related upgrade requirements can be broken into two components: stops and vehicles.

Vehicles are specially adapted for the target group. Because of the low demand estimated for this service, lift-equipped vans are suitable. This would allow supply to better match demand without producing a great deal of over capacity, as would be the case with use of the ORION II.

Stops in this system are of two types: transit stations (subway, bus and GO), and shopping centre stops. Stop modifications are assumed to already exist at many of the system stops, especially at the newer shopping centres. Many currently have curb cuts, accessible washrooms, fountains, telephones, elevators, and automatic doors. Stops that are not adequately equipped to handle the disabled would need minimum upgrading; items such as ramps, benches, shelters, hand rails, signage and accessible washrooms would be provided. Elevators are considered in costs. A requirement for accessible parking is also assumed at stops; although paratransit will be acting as a feeder service to the system, it is expected that most will use private vehicles to get to and from the station (see Table (24).7).

Roadside stops would assume minor upgrades such as shelters, benches, curb cuts, hand rails and minor grade changes.

(24).3.3 DEMAND

The criteria used to define the target population includes those who (as defined in the CHDS) are in Group A who have trouble using public transit because they are unable to get on or off a public transit vehicle.

Vehicle requirements are driven by frequency of service for the Bus LOS and Rail LOS scenarios, and by demand for the On-call system.

(24).3.4 COSTS

Cost elements for this option are detailed in section (24).5. They are classified as capital, operating and maintenance, and feeder costs. A low and high cost is calculated for each. For the feeder costs, the high cost includes a cost for capacity expansion of paratransit.

A 30 year economic period is assumed for the present value analysis at a discount rate of ten percent (approved Treasury Board figure). Salvage values of vehicles are assumed to be nil.

The fare structure, for comparability of service, would be the same as that for existing commuter service (rail or bus, depending on LOS considered) for the non-disabled. Thus, for example, if the user desires a trip from his home in Pickering to downtown Toronto, he would need a feeder trip to the Pickering GO station and a system trip to the Royal York Hotel; his cost would be the cost of the feeder trip plus the fare for the new service (based on equivalent commuter fares). Attendants, if required, pay the same as the user.

(24).4 DEMAND RESULTS

(24).4.1 Target Population

The catchment populations (in 1981 figures) are determined for each of the three routes as described in section (24).2.1. The assumption here is that the target group is willing to travel the same distance as the general population to a fixed route service of a **comparable level of service**. Note that the catchment for the Rail LOS is considerably larger than for the Bus LOS.

Table (24).1 presents the catchment and target estimates for the three routes and for the total system for the rail and bus levels of service. The on-call figures are equivalent to the bus LOS, except ridership is 10% lower. The target population for inbound trips for Route 3 is determined in a similar way to Route 1 and 2. Route 3, however, serves Pearson International Airport (which is not served directly by Wheel-Trans), and estimations of the target population are made specifically for these trips. Here, the populations of **all** regions through which the route traverses are included in estimating the potential users. The incidence of uptake (usage), however, is much lower than for the inbound directions, as shown in the next section.

The target population (1986) for the bus and on-call systems is 4,000, and for rail, it is 9,800 people.

(24).4.2 Ridership

Ridership is estimated from the target populations using incidence rates based on U.S. urban data, from the Transportation Research Board (via CBO [13]). Because of uncertainty, a likely range of incidence uptake is used. Table (24).1 summarizes the ridership (in daily one way trips) for the three routes and the total system for the two levels of service. On-call ridership is equivalent to that of the bus LOS, less 10%.

A maximum ridership incidence is determined from use of the GO bus or rail service (depending on the LOS evaluated) among the general public. This assumes that the target would travel with the same frequency as the general public if there were no (existing) travel barriers. A likely low and high incidence is estimated given that, in the short to medium term, these barriers will remain.

Uptake for those travelling to the airport on route 3 is calculated differently; although the target population is much larger than for the other routes, daily ridership is lower because of the significantly smaller uptake incidence. Ridership is determined in two steps: first, incidence of trips from/to the airport is estimated for all modes using actual airport use data from the CHDS (Table (24).2); second, the proportion of the ridership that would be realized on the specially-routed system is approximated from modal use by the general public for feeder service to and from bus and train stations (Table 3). Figures for senior citizens transferring from/to stations are emphasized in estimating this modal split. Note that, since this is observed use by the general public, paratransit is not included. Since paratransit from Metro Toronto to Pearson involves a transfer (including transfer of luggage etc.), this mode would likely make up a very small portion of trips to the airport by the target population (other difficulties such as connections with flights, and possible flight delays or tardiness would further restrict use of paratransit). Walking as a mode to the airport is assumed to be non-existent. Using regular public transit as a proxy for the specially-routed service, a low, high and maximum percentage is then estimated, and applied to the target from Table (24).1 to get one way weekday trips to the airport along Route 3 using the new service.

The highest ridership figures for the bus LOS occur on route 3 (airport route), with six to twelve daily trips, while the highest for the rail LOS is on route 2 (Pickering to Toronto), with 14 to 27 daily one way trips (route 3 experiences the lowest ridership for rail LOS). Overall, the rail LOS produces just over 1.5 times the demand as the bus LOS; this is due to the improved level of service of rail service (see section (24).1).

SUMMARY OF ANNUAL ONE WAY TRIPS

LOS	LOW	HIGH	AVERAGE
Bus	8,850	16,780	12,800
Rail	14,530	27,560	21,000
On-Call	8,040	15,250	11,600

TABLE (24).1: SPECIALLY-ROUTED FIXED-ROUTE SERVICE: ESTIMATES OF DEMAND & DAILY TRIPS

ROUTE	LOS	TOTAL CATCHMENT POPULATION (1)	DISABLED TARGET POPULATION (2)	LOW DEMAND	HIGH DEMAND (3)	MAX DEMAND
				WEEKDAY RIDERSHIP (TRIPS/DAY)		
Route 1 Oakville to Toronto	Bus	111,000	584	3.8	7.2	27.1
	Rail	472,000	2,483	10.8	20.5	77.6
Route 2 Pickering to Toronto	Bus	74,000	389	2.5	4.8	18.0
	Rail	609,000	3,203	14.0	26.5	100.2
Route 3 Brampton to Toronto	Bus	152,000	800	5.2	9.8	37.1
	Rail	362,000	1,904	8.3	15.8	59.6
Toronto to Airport[4]	Bus	1,592,000	8,374	0.5	1.7	2.9
Total System						
	Bus	763,000	4,013	26.0	49.3	186.2
	Rail	1,860,000	9,784	42.7	81.0	306.0
	On-Call	763,000	4,013	23.6	44.8	16.9

NOTE:
(1) Catchment area defined from 1985 Bus and Rail Survey results using 1981 Statistics Canada population totals projected to 1986 totals
(2) Unable to board criteria - incidence = 0.526%
(3) Ridership incidence (trips/day/target)-from Ref. 22, with adjustments
Bus: Low=0.0065, High=0.0123, Max=0.0464
Rail: Low=0.0044, High=0.0083, Max=0.0312
(4) Assumes trip incidence of 0.00125 for all modes Low = 5% of trips; High = 15% of trips; Max =25% of trips (see Tables 2 and 3)
(5) Trips are one way weekday trips

TABLE (24).2: ESTIMATED INCIDENCE OF AIRPLANE TRIPS (3 MONTH PERIOD)

TARGET GROUP	# OF AIRPLANE TRIPS	# OF PEOPLE ONTARIO (000)	# OF PEOPLE CANADA (000)
UNABLE TO CLIMB STAIRS	TOTAL TARGET	79	189
	NO TRIPS	30	59
	1+ TRIPS	6	12
ALL DISABLED	TOTAL TARGET	937	2,448
	NO TRIPS	590	1,444
	1 TRIP	48	127
	2 TRIPS	13	30
	3+ TRIPS	5	24
	UNKNOWN	25	70
GROUP A	TOTAL 1 + TRIPS	66	181
GROUP B	TOTAL TRIPS 1)	94	287
GROUP C	TOTAL TRIPS/YEAR 2)	376	1,148
GROUP D	TRIPS/PERSON/YEAR 3)	5.7	6.3

Notes:
1) assumes 3+ trips is equivalent to 4 trips
2) BX4 (question was for 3 month period)
3) C/A (incidence of trips for those who take trips)

From D Assume 6 trips/person/year x 6,000 people in group A who take trips = 36,000 trips/yr

trips/year/target = 36,000/79,000 = 0.456

Source: CHDS [2]

TABLE (24).3: MODAL USE BY GENERAL PUBLIC FOR TRANSFERS TO/FROM BUS AND TRAIN STATIONS

TRANSFER TO/FROM BUS STATION LINE MODE	WALK	CAR	CAR PARK		TAXI	P.T.	OTHER
GENERAL PUBLIC							
Residence	16	20		14	13	30	7
Non-residence	24	-	36	--	15	26	-
Average	20	-	35	--	14	28	3
Senior							
Residence	13	13		18	23	29	4
Non-residence	17	-	37	--	24	22	-
Average	15	-	34	--	24	25	2
TRAIN STATION GENERAL PUBLIC							
Residence	4	26		28	16	22	5
Non-residence	15	-	36	--	25	23	-
Average	10	-	45	--	20	22	3
Senior							
Residence	1	18		33	22	20	5
Non-residence	9	-	46	--	29	16	-
Average	5	-	48	--	25	18	3
ESTIMATED DISABLED MODAL SPLIT							
LOW P.T.	0	-	65	-	30	5	-
HIGH P.T.	0	-	60	-	25	15	-
MAX P.T.	0	-	55	-	20	25	-

Source: Reference [22] (MTC Survey)

(24).5 COST RESULTS

(24).5.1 COST ITEMS

Capital Costs:
- vehicle purchases;
- station modifications;

Operating & Maintenance Costs:
- O&M of vehicles;
- maintenance of station equipment.
- training;
- information dissemination;

Feeder Costs: Two times number of trips

(24).5.2 CAPITAL COSTS

(24).5.2.1 Vehicle Requirements

The daily ridership estimates (weekday trips) developed in Section (24).4 are distributed throughout the day to determine peak demand. The three scenarios used to distribute ridership are described in section (24).2.2 -- STEP 4. Two of these scenarios are applied to the low and high ridership estimates, to produce two extremes: High Demand, High Peak and Low Demand, No Peak. Headways are calculated for each of the routes, for each of the three scenarios, for one to six vehicles per route. This is summarized in Table (24).4.

In determining total vehicle requirements and the type of vehicle to use, peak period demand and level of service appear to be the strongest factors. Sufficient vehicles with adequate capacity need to be available to meet peak demand, given a comparable level of service (to existing GO service). The results of the analysis shows that, for the demand estimates generated, enough capacity exists with standard accessible vans to accommodate peak demand; Orion II buses are not required. Table (24).5 presents a summary of vehicle requirements for the three levels of service, for each of the three routes, and for the total GO area. Vehicle requirements for the on-call system are dependent on demand, and not service frequency, and are therefore not as high. Total vehicle requirements includes a 15% margin capacity for spares for all three scenarios.

Capital costs assume $35,000 for a lift-equipped van. Life expectancy of the van and the lift is five to six years. These costs are distributed over five or six years for the bus LOS, four years for the rail LOS, and one to two years for the on-call system (see Table (24).8 -- Capital Cost Summary).

TABLE (24).4: VEHICLE HEADWAYS (in Minutes)

Vehicles Per Route	Scenario High Demand High Peak Route 1	 Route 2	 Route 3	 Low Demand No Peak Route 1	 Route 2	 Route 3
Bus Los						
1	143.4	124.9	160.3	135.9	119.9	149.6
2	69.6	61.0	77.2	67.7	59.8	74.5
3	45.9	40.3	50.8	45.1	39.8	49.6
4	34.3	30.1	37.8	33.8	29.8	37.2
Rail Los						
4	35.2	31.7	38.4	33.8	29.8	37.2
5	27.9	25.0	30.5	27.0	23.9	29.7
6	23.1	20.7	25.0	22.5	19.9	24.6

Peak Service frequency for:

Bus LOS: 30 - 40 minutes
Rail LOS: 20 - 25 minutes

(24).5.2.2 Station Modifications

Since many 'stops' are shopping malls with many of the modifications already in place, costs of these to the system are expected to be minor. Furthermore, many of the costs would be shared with joint owner/operators. Costs for stops that are existing transit stations may be higher. Incremental costs for shopping centres are expected average $50,000, and for stations, about $80,000 each.

The life expectancy of these modifications is expected to be beyond the 30 year cost period. Costs are spread over five to ten years, depending on the level of service scenario considered.

(24).5.2.3 Roadside Stop Modifications

Modifications to roadside stops include items such as shelters, benches, curb cuts, hand grab rails and minor grade changes were necessary. Cost per stop is $3,000 for all levels of service.

(24).5.3 OPERATING AND MAINTENANCE COSTS

(24).5.3.1 Vehicles

Operating and maintenance costs are calculated on a vehicle-hour basis for the rolling stock, which includes driver wages, insurance/damage, fuel, maintenance, administration and overhead. It is assumed to be $30 - $35/vehicle-hour for the lift-equipped van.

Table (24).6 shows the derivation of vehicle hours and calculates O&M costs for each of the levels of service evaluated for the total GO system. Since all vehicles are not purchased in the first year (except for the low resource, on-call scenario), vehicle-hours will increase annually to the time the full vehicle compliment is achieved. This also means that service frequencies desired would not be attained until that time.

(24).5.3.2 Maintenance of Stops

Maintenance costs, including labour, materials, and utilities are expected to average $1,000 per year per station for all stations.

(24).5.3.3 Maintenance of Roadside Stops

The major maintenance component for stops is snow removal. Total costs are expected to be $500 per year per stop.

(24).5.3.4 Training and Promotion

Drivers, mechanics and terminal staff would all require training on the operation and maintenance of the new equipment. Training would include the cost of lost wages, trainers and materials. This is estimated to cost $28,000 per year for the bus and rail LOS scenarios, and $7,000 for the on-call system (based on vehicles in fleet and vehicle use).

Promotion of the new service, which includes preparation and distribution of schedules, advertising and liaison with user groups, is estimated at $5,000 for all LOS scenarios.

(24).5.4 FEEDER COSTS

Table (24).7 identifies a high and low value for feeder cost, based on estimates of the proportion a particular mode is used as feeder service, and the trip cost for each mode. The possible feeder modes include personal vehicle, paratransit, walking, taxi and public transit. The proportion is estimated using uptake of modes of transfer to bus stations [17], and data in the CHDS on use of personal vehicles by the target group, adjusted to reflect the type of service provided (ie. reduced use of personal vehicle and taxi, increased use of paratransit and walking). The target group, as originally defined, does not include individuals who are able to use public transit, and so this mode is eliminated.

TABLE (24).5: VEHICLE REQUIREMENTS

Los	Scenario	Peak Frequency	Vehicles Required in Service			Spare	All Three	Total
			Route 1	Route 2	Route 3	Vehicles	Routes	System (1)
Bus LOS	High Demand & High Peak	30-40 min	4	4	4	2	14	91
	Low Demand & No Peak	30-40 min	4	3	4	2	13	85
Rail LOS	High Demand & High Peak	20-25 min	6	5	6	3	20	40
	Low Demand & No Peak	20-25 min	6	5	6	3	20	40
On-Call	Low Demand		1	1	1	1	4	8
	High Demand		2	2	2	1	7	14

Notes: (1) Total System (Bus LOS) = Three Route (Bus LOS) x 6.5 (20 routes)
Total System (Rail LOS) = Three Route (Rail LOS) x 2 (6 routes)
Total System (On-Call) = Three Route (Bus LOS) x 2 (Demand driven)

TABLE (24).6: VEHICLE O & M COSTS (TOTAL SYSTEM)

LEVEL OF SERVICE	RESOURCE REQUIREMENT	
Bus LOS	Low	High
Daily Demand (Weekday trips)	26	49.3
Frequency - Peak(min)	30-40	30-40
- NonPeak(min)	60	60
Vehicles Required in Service (from Table 5 less 15%)	74	79
Trip Time for all Routes (Hrs) (from Table 4 times 6.5)	43.9	46.3
Vehicle Trips/Route - Weekday	18.85	18.85
- Weekend	16	16
Total Annual Vehicle Hours	288,900	304,700
Cost/Vehicle Hour ($)	30	35
Total O & M Vehicle Cost/Yr	**$8,667,000**	**$10,665,000**
Rail LOS		
Daily Demand (Weekday trips)	42.7	81.0
Frequency - Peak (min)	20-25	20-25
- NonPeak (min)	60	60
Vehicles Required in Service (from Table 5 less 15%)	35	35
Trip Time for all Routes (Hrs) (from Table 4 times 2)	13.5	14.7
Vehicle Trips/Route - Weekday	22.6	22.6
- Weekend	16	16
Total Annual Vehicle Hours	102,000	111,000
Cost/Vehicle Hour ($)	30	35
Total O & M Vehicle Cost/Yr	**$3,060,000**	**$3,889,000**
On-Call System		
Daily Demand (weekday trips)	23.6	44.8
Vehicles Required in Service (from Table 5 less 15%)	7	13
Vehicles Trips (All Routes)		
- Weekday	20	34
- Weekend	14	26
Vehicle Time/Vehicle Trip (Hrs)	2	2
Total Annual Vehicle Hours	13,000	23,000
Cost/Vehicle Hour ($)	30	35
Total O & M Vehicle Cost/Yr	**$390,000**	**$805,000**

The high cost estimate for paratransit includes the cost of expansion of existing paratransit. The incremental capital cost of the additional capacity is calculated in terms of a capital cost per vehicle-hour, based on the cost of a new vehicle, its service life and its utilization. The additional cost is estimated to be \$3.75 per vehicle hour, or about \$2 per feeder trip. Unit costs for the other modes are also varied slightly, to establish a likely range of costs. The resulting range is from \$5.14 to \$7.38 per feeder trip; since each system trip consists of two feeder trips (the transfer from the entrance to a shopping mall to a store within the mall is considered to be a feeder trip), then the total feeder cost per system trip is double this amount.

Table (24).8 summarizes the capital, O&M and feeder costs for each of the LOS scenarios for the total system.

TABLE (24).7: FEEDER COSTS

	Percent Used as Feeder Mode		Feeder Cost/Trip($)		Normalized Feeder Cost/Trip($)	
Feeder Mode	High	Low	High	Low	High	Low
Personal Vehicle (1)	45	50	1.50	1.00	0.68	0.50
Paratransit (2)	35	27	18.00	16.00	6.30	4.32
Walking	15	18	0	0	0	0
Taxi	5	5	8.00	6.40	0.40	0.32
Public Transit			--	--		
Avg. Feeder Cost	100	100			7.38	5.14

Notes:

1) Assumes $0.30/km for high cost; $0.20/km for low cost.

2) Assumes extra capacity requirements for the feeder trips using a capital cost/vehicle-hour of $3.75.

(3) Avg. feeder distance = 5 kilometers

TABLE (24).8: CAPITAL COST SUMMARY

ITEM	COST CHARACTER	BUS LOS		RAIL LOS		ON-CALL	
		LOW	HIGH	LOW	HIGH	LOW	HIGH
Vehicles	Life (Yrs)	6	5	6	5	6	5
	Total Units	85	91	40	40	8	14
	Unit Cost ($000's)	35	35	35	35	35	35
	Period (Yrs)	6	5	4	4	1	1
	Unit Increase/Yr	14	18	10	10	8	14
	Cost/Yr ($000s)	496	637	350	350	280	490
	Years	1-30	1-30	1-4, 7-10 13-16, 19-22 25-28	1-4,6-9 11-14, 16-19 21-24, 26-29	1,7,13,19,25	1,7,13,19,25
Transit Stations	Life (Yrs)	>30	>30	>30	>30	>30	>30
	Total Units	20	20	10	10	20	20
	Unit Cost ($000s)	80	80	80	80	80	80
	Period (Yrs)	10	10	5	5	10	10
	Unit Increase/Yr	2	2	2	2	2	2
	Cost/Yr ($000s)	160	160	160	160	160	160
	Years	1-10	1-10	1-5	1-5	1-10	1-10
Shopping Centre Stations	Life (Yrs)	>30	>30	>30	>30	>30	>30
	Total Units	30	30	10	10	30	30
	Unit Cost($000s)	50	50	50	50	50	50
	Period (Yrs)	10	10	5	5	10	10
	Unit Increase/Yr	3	3	2	2	3	3
	Cost/Yr($000s)	150	150	100	100	150	150
	Years	1-10	1-10	1-5	1-5	1-10	1-10
Stops	Life (Yrs)	>30	>30	>30	>30	>30	>30
	Total Units	130	130	45	45	130	130
	Unit Cost($000s)	3	3	3	3	3	3
	Period (Yrs)	10	10	5	5	10	10
	Unit Increase/Yr	13	13	9	9	13	13
	Cost/Yr($000s)	39	39	27	27	39	39
	Years	1-10	1-10	1-5	1-5	1-10	1-10

TABLE (24).9: ANNUAL O & M AND FEEDER COST SUMMARY

ITEM	COST CHARACTER	BUS LOS		RAIL LOS		ON-CALL	
		LOW	HIGH	LOW	HIGH	LOW	HIGH
Vehicles (Vehicle-hours)	Unit Cost ($/v-h)	30	35	30	35	30	35
	Unit Increase/Yr	48,150	60,940	25,500	27,750	13,000	23,000
	Inc Cost/Yr ($000)	1,445	2,133	765	971	390	805
	Years Increasing	6	5	4	4	1	1
	Steady Cost($000's)	8,667	10,665	3,060	3,889	390	805
Stops	Unit Cost($000s)	1	1	1	1	1	1
	Unit Increase/Yr	4	4	3	3	4	4
	Inc Cost/Yr($000s)	4	4	3	3	4	4
	Years Increasing	10	10	5	5	10	10
	Steady Cost($000s)	40	40	15	15	40	40
Roadside Stops	Unit Cost($000s)	0.5	0.5	0.5	0.5	0.5	0.5
	Unit Increase/Yr	13	13	9	9	13	13
	Inc Cost/Yr($000s)	6.5	6.5	4.5	4.5	6.5	6.5
	Years Increasing	10	10	5	5	10	10
	Steady Cost($000s)	65	65	22.5	22.5	65	65
Other -Training -Promotion	Unit Cost($000s)	33	33	19	19	12	12
	Steady Cost($000s)	33	33	19	19	12	12
Feeder	Unit Cost/Trip	10.28	14.76	10.28	14.76	10.28	14.76
	Total Trips/Yr	8,850	16,780	14,530	27,560	8,040	15,250
	Total Cost($000s)	91.0	247.7	149.4	406.8	82.7	225.1

(24).5.5 TOTAL COSTS AND UNIT COSTS

Cost per trip, total 30 year present value costs and year-to-year budgetary costs for each of the LOS scenarios are presented in Tables (24).10, (24).11 and (24).12. Because of the large number of vehicles required for the Bus LOS and the relatively low demand, total cost and cost per trip is the highest of the three LOSs at a present value total cost of $80 to $104 million over 30 years and $596 to $874 per trip. The total 30 year cost for the Rail LOS is less than half of this, at $33 to $44 million, and, because of the proportionately higher demand, cost per trip is about one quarter at $150 to $220. Note that because these two LOSs are driven by level of service and not demand, many vehicles will be travelling empty. The on-call system is demand driven, and hence, has the lowest total cost and cost per trip at a present value total cost of $9 to $15 million over 30 years, and $95 to $104 per trip.

Net average annual and 30 year costs are total costs excluding fares. Assumming a $5 per trip fare on this system ($3 for two feeder trips, $2 for equivalent GO fare) the percentage of fares to total cost for the bus, rail and on-call LOSs is 1%, 3% and 5%, respectively.

SUMMARY OF ANNUAL TOTAL COSTS
(000s)

SCENARIO	LOW	HIGH	AVERAGE	NET AVERAGE
Bus LOS	$7,700	$10,000	$8,900	$8,800
Rail LOS	3,200	4,200	3,700	3,600
On-Call	800	1,500	1,150	1,100

SUMMARY OF TOTAL 30 YEAR COST - PRESENT VALUE
(000s)

SCENARIO	LOW	HIGH	AVERAGE	NET AVERAGE
Bus LOS	$80,200	$103,700	$91,950	$91,000
Rail LOS	33,300	43,800	38,600	37,400
On-Call	8,700	15,000	11,900	11,300

SUMMARY OF UNIT COSTS

SCENARIO	LOW	HIGH	AVERAGE
Bus LOS	$596	$874	$735
Rail LOS	150	220	185
On-Call	95	104	100

The provincial share of net total costs (costs excluding revenue from fares) is 100%. Therefore the net budgetary outlay for 1986, shown above in "Summary of Annual Total Costs", is completely covered by the province. Since excess capacity exists on the bus and rail LOS options, future growth in demand will not require significant increase in cost. Allowing 5% inflation per year, however, the annual budgetary outlay for 1996 is estimated at $14 million and $5.9 million for the bus and rail LOSs, respectively; this also represents the provincial share. The on-call system will need to expand as demand increases, and therefore costs will increase due to both inflation and growth. The estimated budget for 1996 for the on-call option is $2.2 million.

TABLE 24.10: SPECIALLY-ROUTED FIXED-ROUTE OPTION (BUS LOS): TOTAL SYSTEM COSTS

YEAR	CAPITAL COSTS (000s)		OPERATING & MAINTENANCE (000s)		FEEDER COSTS (000s)		TOTAL (000s)	
	LOW	HIGH	LOW	HIGH	LOW	HIGH	LOW	HIGH
1	$845	$986	$1,489	$2,177	$91	$248	$2,424	$3,410
2	$845	$986	$2,944	$4,320	$91	$248	$3,880	$5,554
3	$845	$986	$4,400	$6,464	$91	$248	$5,335	$7,697
4	$845	$986	$5,855	$8,607	$91	$248	$6,791	$9,841
5	$845	$986	$7,311	$10,751	$91	$248	$8,246	$11,984
6	$845	$986	$8,766	$10,761	$91	$248	$9,702	$11,995
7	$845	$986	$8,777	$10,772	$91	$248	$9,712	$12,005
8	$845	$986	$8,787	$10,782	$91	$248	$9,723	$12,016
9	$845	$986	$8,798	$10,793	$91	$248	$9,733	$12,026
10	$845	$986	$8,808	$10,803	$91	$248	$9,744	$12,037
11	$496	$637	$8,808	$10,803	$91	$248	$9,395	$11,688
12	$496	$637	$8,808	$10,803	$91	$248	$9,395	$11,688
13	$496	$637	$8,808	$10,803	$91	$248	$9,395	$11,688
14	$496	$637	$8,808	$10,803	$91	$248	$9,395	$11,688
15	$496	$637	$8,808	$10,803	$91	$248	$9,395	$11,688
16	$496	$637	$8,808	$10,803	$91	$248	$9,395	$11,688
17	$496	$637	$8,808	$10,803	$91	$248	$9,395	$11,688
18	$496	$637	$8,808	$10,803	$91	$248	$9,395	$11,688
19	$496	$637	$8,808	$10,803	$91	$248	$9,395	$11,688
20	$496	$637	$8,808	$10,803	$91	$248	$9,395	$11,688
21	$496	$637	$8,808	$10,803	$91	$248	$9,395	$11,688
22	$496	$637	$8,808	$10,803	$91	$248	$9,395	$11,688
23	$496	$637	$8,808	$10,803	$91	$248	$9,395	$11,688
24	$496	$637	$8,808	$10,803	$91	$248	$9,395	$11,688
25	$496	$637	$8,808	$10,803	$91	$248	$9,395	$11,688
26	$496	$637	$8,808	$10,803	$91	$248	$9,395	$11,688
27	$496	$637	$8,808	$10,803	$91	$248	$9,395	$11,688
28	$496	$637	$8,808	$10,803	$91	$248	$9,395	$11,688
29	$496	$637	$8,808	$10,803	$91	$248	$9,395	$11,688
30	$496	$637	$8,808	$10,803	$91	$248	$9,395	$11,688
NPV	$7,502	$8,964	$71,741	$92,171	$943	$2,568	$80,186	$103,703

AVERAGE ANNUAL COST (000s)	$7,733	$10,001
AVERAGE ANNUAL DEMAND (000s) *	8.85	16.78
30 YEAR PV OF DEMAND (000s)	91.7	174.0
COST/TRIP	$874	$596

* Accounts for one third less travel on weekends (Ref. 3).

All figures adjusted to 1986

TABLE 24.11: SPECIALLY-ROUTED FIXED-ROUTE OPTION (RAIL LOS): TOTAL SYSTEM COSTS

YEAR	CAPITAL COSTS (000s)		OPERATING & MAINTENANCE (000s)		FEEDER COSTS (000s)		TOTAL (000s)	
	LOW	HIGH	LOW	HIGH	LOW	HIGH	LOW	HIGH
1	$637	$637	$792	$998	$149	$407	$1,578	$2,041
2	$637	$637	$1,564	$1,976	$149	$407	$2,350	$3,020
3	$637	$637	$2,337	$2,955	$149	$407	$3,123	$3,998
4	$637	$637	$3,109	$3,933	$149	$407	$3,895	$4,977
5	$287	$287	$3,117	$3,941	$149	$407	$3,553	$4,634
6		$350	$3,117	$3,941	$149	$407	$3,266	$4,697
7	$350	$350	$3,117	$3,941	$149	$407	$3,616	$4,697
8	$350	$350	$3,117	$3,941	$149	$407	$3,616	$4,697
9	$350	$350	$3,117	$3,941	$149	$407	$3,616	$4,697
10	$350		$3,117	$3,941	$149	$407	$3,616	$4,347
11		$350	$3,117	$3,941	$149	$407	$3,266	$4,697
12		$350	$3,117	$3,941	$149	$407	$3,266	$4,697
13	$350	$350	$3,117	$3,941	$149	$407	$3,616	$4,697
14	$350	$350	$3,117	$3,941	$149	$407	$3,616	$4,697
15	$350		$3,117	$3,941	$149	$407	$3,616	$4,347
16	$350	$350	$3,117	$3,941	$149	$407	$3,616	$4,697
17		$350	$3,117	$3,941	$149	$407	$3,266	$4,697
18		$350	$3,117	$3,941	$149	$407	$3,266	$4,697
19	$350	$350	$3,117	$3,941	$149	$407	$3,616	$4,697
20	$350		$3,117	$3,941	$149	$407	$3,616	$4,347
21	$350	$350	$3,117	$3,941	$149	$407	$3,616	$4,697
22	$350	$350	$3,117	$3,941	$149	$407	$3,616	$4,697
23		$350	$3,117	$3,941	$149	$407	$3,266	$4,697
24		$350	$3,117	$3,941	$149	$407	$3,266	$4,697
25	$350		$3,117	$3,941	$149	$407	$3,616	$4,347
26	$350	$350	$3,117	$3,941	$149	$407	$3,616	$4,697
27	$350	$350	$3,117	$3,941	$149	$407	$3,616	$4,697
28	$350	$350	$3,117	$3,941	$149	$407	$3,616	$4,697
29		$350	$3,117	$3,941	$149	$407	$3,266	$4,697
30			$3,117	$3,941	$149	$407	$3,266	$4,347
PV	$3,838	$4,232	$27,930	$35,312	$1,549	$4,219	$33,317	$43,762

	LOW	HIGH
AVERAGE ANNUAL COST (000s)	$3,213	$4,220
AVERAGE ANNUAL DEMAND (000s) *	14.53	27.56
30 YEAR PV OF DEMAND (000s)	150.7	285.8
COST/TRIP	$221	$153

* Accounts for one third less travel on weekends (Ref. 3)

All figures adjusted to 1986

TABLE 24.12: SPECIALLY-ROUTED FIXED-ROUTE OPTION (ON-CALL) TOTAL SYSTEM COSTS

YEAR	CAPITAL COSTS (000s)		OPERATING & MAINTENANCE (000s)		FEEDER COSTS (000s)		TOTAL (000s)	
	LOW	HIGH	LOW	HIGH	LOW	HIGH	LOW	HIGH
1	$629	$839	$413	$828	$83	$225	$1,124	$1,892
2	$349	$349	$423	$838	$83	$225	$855	$1,412
3	$349	$349	$434	$849	$83	$225	$865	$1,423
4	$349	$349	$444	$859	$83	$225	$876	$1,433
5	$349	$349	$455	$870	$83	$225	$886	$1,444
6	$349	$839	$465	$880	$83	$225	$897	$1,944
7	$629	$349	$476	$891	$83	$225	$1,187	$1,465
8	$349	$349	$486	$901	$83	$225	$918	$1,475
9	$349	$349	$497	$912	$83	$225	$928	$1,486
10	$349	$349	$507	$922	$83	$225	$939	$1,496
11		$490	$507	$922	$83	$225	$590	$1,637
12			$507	$922	$83	$225	$590	$1,147
13	$280		$507	$922	$83	$225	$870	$1,147
14			$507	$922	$83	$225	$590	$1,147
15			$507	$922	$83	$225	$590	$1,147
16		$490	$507	$922	$83	$225	$590	$1,637
17			$507	$922	$83	$225	$590	$1,147
18			$507	$922	$83	$225	$590	$1,147
19	$280		$507	$922	$83	$225	$870	$1,147
20			$507	$922	$83	$225	$590	$1,147
21		$490	$507	$922	$83	$225	$590	$1,637
22			$507	$922	$83	$225	$590	$1,147
23			$507	$922	$83	$225	$590	$1,147
24			$507	$922	$83	$225	$590	$1,147
25	$280		$507	$922	$83	$225	$870	$1,147
26		$490	$507	$922	$83	$225	$590	$1,637
27			$507	$922	$83	$225	$590	$1,147
28			$507	$922	$83	$225	$590	$1,147
29			$507	$922	$83	$225	$590	$1,147
30			$507	$922	$83	$225	$590	$1,147
PV	$2,965	$3,577	$4,883	$9,186	$857	$2,334	$8,705	$15,098
			AVERAGE ANNUAL COST (000s)				$840	$1,456
			AVERAGE ANNUAL DEMAND (000s) *				8.04	15.25
			30 YEAR PV OF DEMAND (000s)				83.4	158.2
			COST/TRIP				$104	$95

* Accounts for onr third less travel on weekends (Ref. 3)

All figures adjusted to 1986

(24).6 INTANGIBLE COSTS AND BENEFITS

Many aspects of the accessible bus issue cannot be quantified. Some attempt has been made in this study to address these questions in an objective manner. To be specific, intangible costs and benefits generally reflect a positive or negative assessment of several different criteria including: groups included or excluded, peripheral groups who may benefit; quality of service (physical and mental comfort, independence, dignity, etc.); compatibility with existing systems; development risk (control of costs, development time frame, industry inertia, technical feasibility, etc.); and integration.

(24).6.1 OPERATIONAL RISK

Some congestion at stations may occur, but with the small number of vehicles and stations involved (and small estimated demand), it is unlikely that it will be severe enough to cause any major operational problems.

As with most options, there is some risk associated with the uncertainty in demand. This uncertainty usually has both operational and economic implications. For this option, if demand is underestimated then there is the possibility that eligible users will be denied access due to a lack of capacity on some vehicles or routes, and may be forced to wait for the next bus. Some rescheduling, or additional capacity would be required in this case. On the other hand if demand is not large enough to support this system, then from a cost-effectiveness point of view it becomes very costly.

There is also the possibility that current paratransit systems cannot provide a feasible feeder service due to long reservation periods, capacity constraints etc. While other modes are also available as a feeder service, the parallel system depends on a good feeder system that includes paratransit.

Overall, the operational risks are fairly small when compared to some of the other options. To minimize these, a pilot system (described in section 1) can be implemented quite quickly and cheaply.

(24).6.2 OTHER DEVELOPMENT CONSIDERATIONS

Quality of Service: The vehicles proposed for this option are the same as those currently used in many paratransit operations (lift-equipped vehicles). Thus quality of service should be comparable to paratransit, and better than accessible bus or rail service.

Level of Service: This option provides a moderate level of service comparable to what is available to the general public for the following reasons:

- o ability to make cross-boundary trips quickly;
- o not necessary to book in advance (except where paratransit needs to be used as a feeder service).
- o the accompanying feeder service would be door to station and station to door;

- fares on the system would be comparable to GO fares; and

- the frequency of service, hours of operation, and number of stations per kilometre are comparable to existing public commuter transit (Bus or Rail);

In decreasing order of LOS for the variations, they are: Rail LOS, Bus LOS, and On-Call.

Development Risk: No development of he technology is required. However, development of the infrastructure (dispatching for the on-call system, scheduling for the fixed-schedule scenarios) would require some effort, as would the operational logistics of such a system. The risk and development time frame is expected to be minimal.

System Compatibility: The success of the specially-routed fixed-route system will depend largely on how well paratransit operations can coordinate their operations to act as a feeder service. It is not, however, intended to replace any existing transportation services for the target, but to make cross-boundary trips easier, faster and more economic than what is currently available. The system is not expected to interfere with existing public transit services for the general public.

Public Acceptability: The specially-routed fixed-route system is separate from existing conventional public transit services. Some increased congestion at subway stations, GO stations and at the shopping mall stations may result with implementation of this option, but not to the extent that should affect the travel behaviour of the general public. Some private owners (shopping centres) may be reluctant to offer additional disabled parking to an individual who is not intending to shop but continue to another destination (via the new system). No guarantees can be made to ensure those using the parking facilities will infact shop at the centre (as is the situation with many malls now for all users), but the system is designed to attempt to make these stops destination points and not transportation hubs.

Integration: This option gives the disabled community the same opportunities and service as that offered to the able-bodied (i.e. a legitimate public commuter transportation service for the disabled); although the service is not truly integrated, it does provide comparable level of service.

OPTION (25) DESIGN IMPROVEMENTS FOR AMBULATORY PASSENGERS

(25).1 SECTOR:

- Inter-Regional (GO).

(25).2 TARGET GROUP

- Those who use public transit with difficulty.

(25).3 DESCRIPTION

This option is virtually identical in rationale and content to that proposed for urban public transit systems (Option 11). It involves minor equipment and operational upgrades to GO trains, buses and terminals, over time, with a fixed budget and schedule.

There is one difference from the urban situation. The Ontario government does not have the same relationship with GO Transit as it does with the municipal operators. The province essentially dictates overall policy for GO, and can thus enforce these initiatives without major difficulties.

(25).4 RELEVANT CURRENT INITIATIVES

- Capital retrofit subsidies (Appendix E.1.3).
- PST exemptions - equipment (E.1.4).
- GO Transit (E.1.8).
- Safety inspection programs (E.1.2).
- Terminal upgrades (E.2.6).
- VIA Rail upgrades standards (E.2.).

(25).5 TOTAL MARKET

2.7% of the GO Service Area population will benefit from this initiative, or 59,000 travellers.

(25).6 MARKET NEED SERVED

For the general population, the ratio of monthly GO trips to all Ontario public transit trips is (2.2M/26.5M) 8.3%. (From CUTA ridership trends, January 1978). The total annual trip making on public transit for disabled person in Ontario in 20.4M trips/year. Assuming that moderately disabled persons will use the upgraded GO system at the same rate as the general population, the projected ridership associated with this option is 1.8M trips year.

(25).7 TOTAL COSTS

Table (25).1 shows the component costs for upgrading the GO system which, when spread over 15 years, average $102,000/year. Assume 10% of the costs are covered by fares; thus the cost to the province is $92,000/year.

TABLE (25).1 ESTIMATED COSTS FOR UPGRADING THE GO SYSTEM FOR AMBULATORY PASSENGERS

Item	Number of Items in System[1]	Cost Per Item[2]	Total Cost
Buses	200	$1,900	$ 380K
Bus Terminals	32	$7,400	$ 237K
Bus Stops	150	$1,200	$ 180K
Rail Cars	150	$1,900	$ 285K
Rail Stations	50	$7,400	$ 370K
Subtotal	--	--	$1,452K
O & M Costs	5% of subtotal		$ 72K
TOTAL (over 15 years)			$1,524K
ANNUAL COST			$ 102K/year
NET ANNUAL COST[3]			$ 92K/year
COST TO PROVINCE[4]			$ 92K/year

Notes:

(1) JFH estimates, based on GO operational data.
(2) As derived for Option (11).
(3) 10% of GO costs are assumed by the user, through fares.
(4) 100% of the net costs are borne by the province.

The annual cost in 1996, once inflation is accounted for, is approximately $200,000/year. The total costs present valued over 30 years are $1M.

(25).8 UNIT COSTS

This option serves 1.8 million trips annually at a cost of $100,000 per year, giving an extremely low unit cost of $0.06/trip.

(25).9 -- (25).17 OTHER ITEMS

Similar to Option (11).